

## Inguinal hernia

Search date September 2007

Andre Chow, Sanjay Purkayastha, Thanos Athanasiou, Paris Tekkis, and Ara Darzi

### ABSTRACT

**INTRODUCTION:** The main risk factors for inguinal hernia are male sex and increasing age. Complications of inguinal hernia include strangulation, intestinal obstruction, and infarction. Recurrence can occur after surgery. **METHODS AND OUTCOMES:** We conducted a systematic review and aimed to answer the following clinical questions: What are the effects of elective treatments for primary unilateral, primary bilateral, and recurrent inguinal hernia in adults? We searched: Medline, Embase, The Cochrane Library, and other important databases up to September 2007 (Clinical Evidence reviews are updated periodically; please check our website for the most up-to-date version of this review). We included harms alerts from relevant organisations, such as the US Food and Drug Administration (FDA) and the UK Medicines and Healthcare products Regulatory Agency (MHRA). **RESULTS:** We found 24 systematic reviews, RCTs, or observational studies that met our inclusion criteria. We performed a GRADE evaluation of the quality of evidence for interventions. **CONCLUSIONS:** In this systematic review, we present information relating to the effectiveness and safety of the following interventions: expectant management, open mesh repair, open suture repair, totally extraperitoneal (TEP) laparoscopic repair, and transabdominal preperitoneal (TAPP) laparoscopic repair.

QUESTIONS	
What are the effects of elective treatments for primary unilateral inguinal hernia in adults? . . . . .	3
What are the effects of elective treatments for primary bilateral inguinal hernia in adults? . . . . .	31
What are the effects of elective treatments for recurrent inguinal hernia in adults? . . . . .	42

INTERVENTIONS	
<b>UNILATERAL INGUINAL HERNIA</b>	
<b>Beneficial</b>	
Open mesh repair (reduced recurrence compared with open suture repair, with no increase in surgical complications) . . . . .	3
Totally extraperitoneal (TEP) laparoscopic repair (reduced pain and time to return to usual activities compared with open repair) . . . . .	11
Transabdominal preperitoneal (TAPP) laparoscopic repair (reduced pain and time to return to usual activities compared with open repair) . . . . .	22
<b>Likely to be beneficial</b>	
Open suture repair (conventional, well-established surgical technique, but less effective for improving clinically important outcomes than open mesh repair, laparoscopic repair)* . . . . .	30
<b>Unknown effectiveness</b>	
Expectant management . . . . .	30
<b>BILATERAL INGUINAL HERNIA</b>	
<b>Likely to be beneficial</b>	
Open mesh repair (may reduce length of hospital stay compared with open suture repair) . . . . .	31
Open suture repair (conventional, well-established surgical technique, but may be less effective in improving clinically important outcomes than open mesh repair or transabdominal preperitoneal [TAPP] laparoscopic repair)* . . . . .	33
Totally extraperitoneal (TEP) laparoscopic repair (similar outcomes to open mesh repair) . . . . .	34
Transabdominal preperitoneal (TAPP) laparoscopic repair (may reduce time to return to normal activities compared with open repair) . . . . .	37
<b>Unknown effectiveness</b>	
Expectant management . . . . .	41
<b>RECURRENT INGUINAL HERNIA</b>	
<b>Likely to be beneficial</b>	
Open mesh repair (slightly reduced length of hospital stay compared with open suture repair; other effects uncertain) . . . . .	42
Open suture repair (conventional, well-established surgical technique, but may be less effective than open mesh repair or transabdominal preperitoneal [TAPP] laparoscopic repair in improving clinically important outcomes)* . . . . .	44
Totally extraperitoneal (TEP) laparoscopic repair (may reduce time to return to normal activities compared with open mesh repair) . . . . .	45
Transabdominal preperitoneal (TAPP) laparoscopic repair (may reduce time to return to normal activities compared with open repair; other effects uncertain) . . . . .	49
<b>Unknown effectiveness</b>	
Expectant management . . . . .	56
<b>Footnote</b>	
*Based on clinical experience and consensus.	

### Key points

- The main risk factors for inguinal hernia are male sex and increasing age.

Complications of inguinal hernia include strangulation, intestinal obstruction, and infarction. Recurrence can occur after surgery.

- The consensus is that surgery is the treatment of choice for inguinal hernia, although few good-quality studies have compared surgery with [expectant management](#).

- [Open suture repair](#) is a well-established surgical treatment for people with unilateral inguinal hernia, but seems less effective at preventing recurrence, and prolongs recovery, compared with other techniques.

[Open mesh repair](#) reduces the risk of recurrence compared with open suture repair, without increasing the rate of surgical complications.

[Totally extraperitoneal \(TEP\) laparoscopic repair](#) may lead to less pain, faster recovery, and similar recurrence rates compared with open mesh repair, but studies have given inconclusive results.

[Transabdominal preperitoneal \(TAPP\) laparoscopic repair](#) reduces pain and speeds up recovery compared with open mesh repair, but both procedures have similar recurrence rates.

- [Open suture repair](#) may be associated with longer recovery times compared with open mesh repair or TAPP laparoscopic repair in people with bilateral inguinal hernia.

[Open mesh repair](#) seems as effective as [TEP](#) laparoscopic repair, but may prolong recovery and increase complication rates compared with [TAPP](#) laparoscopic repair.

- [Open suture repair](#) may be associated with an increased recovery time compared with [open mesh repair](#) in people with recurrent inguinal hernia.

We don't know how open suture repair compares with [TEP](#) or [TAPP](#) laparoscopic repair in people with recurrent inguinal hernia.

TAPP and TEP laparoscopic repair may both reduce recovery time compared with open mesh repair, but complication rates seem to be similar.

---

**DEFINITION** Inguinal hernia is an out-pouching of the peritoneum, with or without its contents, which occurs through the muscles of the anterior abdominal wall at the level of the inguinal canal in the groin. It almost always occurs in men because of the inherent weakness of the abdominal wall where the spermatic cord passes through the inguinal canal. A portion of bowel may become caught in the peritoneal pouch and present as a lump in the groin. The hernia may extend into the scrotum and can cause discomfort or ache. Primary hernias relate to the first presentation of a hernia, and are distinct from recurrent hernias. A hernia is described as reducible if it occurs intermittently (e.g., on straining or standing) and can be pushed back into the abdominal cavity, or irreducible if it remains permanently outside the abdominal cavity. Inguinal hernia is usually a long-standing condition and the diagnosis is made clinically, on the basis of these typical symptoms and signs. The condition may occur in one groin (unilateral hernia) or both groins simultaneously (bilateral hernia), and may recur after treatment (recurrent hernia). Inguinal hernias are frequently classified as direct or indirect, depending on whether the hernia sac bulges directly through the posterior wall of the inguinal canal (direct hernia), or whether it passes through the internal inguinal ring alongside the spermatic cord and follows the course of the inguinal canal (indirect hernia). Occasionally, hernia may present acutely because of complications (see prognosis). Clinical experience and consensus suggest that surgical intervention is an effective treatment for inguinal hernia. However, surgery is associated with complications (see outcomes). Therefore, much of this review examines the relative effectiveness and safety of different surgical techniques. None of the studies that we identified distinguished between direct and indirect types of inguinal hernia. Identified studies gave little detail about the severity of hernia among included participants. In general, studies explicitly excluded people with irreducible or complicated hernia, large hernia (extending into the scrotum), or serious comorbidity, and those at high surgical risk (e.g., because of coagulation disorders). In this review, we deal only with non-acute uncomplicated inguinal hernias in adults.

---

**INCIDENCE/  
PREVALENCE** Inguinal hernia is usually repaired surgically in resource-rich countries. Therefore, surgical audit data provide reasonable estimates of incidence. We found one nationally mandated guideline, which reported that in 2001–2002 there were about 70,000 inguinal hernia surgeries performed in England, involving 0.14% of the population, and requiring over 100,000 NHS hospital-bed days.<sup>[1]</sup> Of these procedures, 62,969 were for the repair of primary hernias and 4939 were for the repair of recurrent hernias. A similar number of inguinal hernia repairs were undertaken in public healthcare settings in England in 2002–2003.<sup>[2]</sup> In the USA, estimates based on cross-sectional data suggest that about 700,000 inguinal hernia repairs were undertaken in 1993.<sup>[3]</sup> A national survey of general practices, covering about 1% of the population of England and Wales in 1991–1992, found that about 95% of people presenting to primary-care settings with inguinal hernia were male.<sup>[4]</sup> It found that the incidence rose from about 11/10,000 person-years in men aged 16 to 24 years to about 200/10,000 person-years in men aged 75 years and over.

**AETIOLOGY/ RISK FACTORS** Age and male sex are risk factors. Chronic cough and manual labour involving heavy lifting are conventionally regarded as risk factors because they lead to high intra-abdominal pressure. Obesity has also been suggested as a risk factor.

**PROGNOSIS** Strangulation, intestinal obstruction, and infarction are the most important acute complications of untreated hernia, and are potentially life-threatening. National statistics from England found that 5% of primary inguinal hernia repairs were undertaken as emergencies (presumably because of acute complications) in 1998–1999.<sup>[2]</sup> Older age, longer duration of hernia, and longer duration of irreducibility are thought to be risk factors for acute complications.<sup>[5]</sup>

**AIMS OF INTERVENTION** To prevent recurrence; to alleviate symptoms; to allow return to normal activities; to improve quality of life; to prevent acute hernia complications; to minimise adverse effects of treatment.

**OUTCOMES** **Pain** (persistent or continuing hernia pain); **hernia complications**; **hospitalisation** (hospital stay, operation duration); **return to normal activities/work**; **recurrence**; **quality of life**; **adverse effects** (seroma; haematoma; numbness; infection; postoperative pain, vascular injury; visceral injury; wound hernia or dehiscence; surgical mortality; and other complications of intervention).

**METHODS** *Clinical Evidence* search and appraisal September 2007. The following databases were used to identify studies for this systematic review: Medline 1966 to September 2007, Embase 1980 to September 2007, and The Cochrane Database of Systematic Reviews and Cochrane Central Register of Controlled Clinical Trials 2007, Issue 3. Additional searches were carried out using these websites: NHS Centre for Reviews and Dissemination (CRD) — for Database of Abstracts of Reviews of Effects (DARE) and Health Technology Assessment (HTA) — and NICE. We also searched for retractions of studies included in the review. Abstracts of the studies retrieved from the initial search were assessed by an information specialist. Selected studies were then sent to the contributor for additional assessment, using predetermined criteria to identify relevant studies. Study design criteria for inclusion in this review were: published systematic reviews and RCTs in any language; "open", "open-label", or non-blinded studies were included where blinding was impossible; and containing more than 20 individuals of whom more than 80% were followed up. There was no minimum length of follow-up required to include studies. We also did a search for cohort and cross-sectional studies relating to "expectant management". In addition, we use a regular surveillance protocol to capture harms alerts from organisations such as the FDA and the MHRA, which are added to the reviews as required. To aid readability of the numerical data in our reviews, we round many percentages to the nearest whole number. Readers should be aware of this when relating percentages to summary statistics such as RRs and ORs. We have performed a GRADE evaluation of the quality of evidence for interventions included in this review (see table, p 60). The categorisation of the quality of the evidence (high, moderate, low, or very low) reflects the quality of evidence available for our chosen outcomes in our defined populations of interest. These categorisations are not necessarily a reflection of the overall methodological quality of any individual study, because the Clinical Evidence population and outcome of choice may represent only a small subset of the total outcomes reported, and population included, in any individual trial. For further details of how we perform the GRADE evaluation and the scoring system we use, please see our website ([www.clinicalevidence.com](http://www.clinicalevidence.com)).

**QUESTION** What are the effects of elective treatments for primary unilateral inguinal hernia in adults?

**OPTION** OPEN MESH REPAIR FOR UNILATERAL INGUINAL HERNIA

- For GRADE evaluation of interventions for Inguinal hernia, see table, p 60 .
- Open mesh repair reduces the risk of recurrence compared with open suture repair, without increasing the rate of surgical complications.

## Benefits and harms

### Open mesh repair versus expectant management (in people with minimally symptomatic hernia):

We found two RCTs comparing open mesh repair versus expectant management.<sup>[6]</sup> <sup>[7]</sup>

#### Pain

*Open mesh repair compared with expectant management (in people with minimally symptomatic hernia)* Open mesh repair may be no more effective than expectant management at reducing pain scores (measured by visual analogue pain scores [VAS]) at rest or on movement at 6 to 12 months, or at reducing the proportion of people with pain that limits normal activities at 2 years (very low-quality evidence).

Ref (type)	Population	Outcome, Interventions	Results and statistical analysis	Effect size	Favours
<b>Pain</b>					
[6] RCT	720 men; 619 unilateral, 77 recurrent	<b>Proportion of people with pain that limited normal activities , at 2 years</b> 2.21% with open mesh repair 5.07% with expectant management Intention-to-treat analysis; see further information on studies for data from as-treated analysis	Risk difference (RD) 2.88% 95% CI -0.04% to +5.77% P = 0.52 See further information on studies for discussion of generalisability of results	↔	Not significant
[7] RCT	160 men; 147 unilateral, 4 recurrent	<b>Pain (assessed by visual analogue score [VAS]) at rest , at 6 months</b> with open mesh repair with expectant management See further information on studies for information on crossover from expectant management to surgical repair	Difference in proportions +7% 95% CI -8 to +22% P = 0.42 See further information on studies for discussion of generalisability of results	↔	Not significant
[7] RCT	160 men; 147 unilateral, 4 recurrent	<b>Pain (assessed by VAS) on movement , at 6 months</b> with open mesh repair with expectant management See further information on studies for information on crossover from expectant management to surgical repair	Difference in proportions +11% 95% CI -5 to +26% P = 0.20 See further information on studies for discussion of generalisability of results	↔	Not significant
[7] RCT	160 men; 147 unilateral, 4 recurrent	<b>Pain (assessed by VAS) at rest , at 12 months</b> with open mesh repair with expectant management See further information on studies for information on crossover from expectant management to surgical repair	Difference in proportions -2% 95% CI -17 to +12% P = 0.86 See further information on studies for discussion of generalisability of results	↔	Not significant
[7] RCT	160 men; 147 unilateral, 4 recurrent	<b>Pain (assessed by VAS) on movement , at 12 months</b> with open mesh repair with expectant management See further information on studies for information on crossover from expectant management to surgical repair	Difference in proportions +8% 95% CI -7 to +23% P = 0.31 See further information on studies for discussion of generalisability of results	↔	Not significant

**Hernia complications**

*Open mesh repair compared with expectant management (in people with minimally symptomatic hernia) Open mesh repair may be no more effective than expectant management at reducing mortality (very low-quality evidence).*

Ref (type)	Population	Outcome, Interventions	Results and statistical analysis	Effect size	Favours
<b>Mortality</b>					
[6] RCT	720 men; 619 uni-lateral, 77 recurrent	<b>Mortality</b> 10/356 (3%) with <a href="#">open mesh repair</a> 12/364 (3%) with expectant management Intention-to-treat analysis; see further information on studies for data from as-treated analysis	P = 0.70 See further information on studies for discussion of generalisability of results	↔	Not significant

No data from the following reference on this outcome. [7]

**Quality of life**

*Open mesh repair compared with expectant management (in people with minimally symptomatic hernia)* We don't know whether [open mesh repair](#) is more effective than expectant management at improving quality-of-life scores (as measured by SF-36) (*very low-quality evidence*).

Ref (type)	Population	Outcome, Interventions	Results and statistical analysis	Effect size	Favours
<b>Quality of life</b>					
[6] RCT	720 men; 619 uni-lateral, 77 recurrent	<b>Mean change in physical component score (scale 0–100) of the SF-36 health-related quality-of-life survey (change from baseline), at 2 years</b> 0.13 with <a href="#">open mesh repair</a> 0.29 with expectant management Intention-to-treat analysis; see further information on studies for data from as-treated analysis	Difference 0.16 95% CI –1.19 to +1.50 P = 0.79 See further information on studies for discussion of generalisability of results	↔	Not significant
[7] RCT	160 men; 147 uni-lateral, 4 recurrent	<b>SF-36 quality-of-life survey, at 6 months</b> with <a href="#">open mesh repair</a> with expectant management Consistent improvement in all dimensions (except the emotional role)	Mean difference 8 95% CI 2 to 14 P = 0.0079 See further information on studies for discussion of generalisability of results	○○○	open mesh repair
[7] RCT	160 men; 147 uni-lateral, 4 recurrent	<b>SF-36 quality-of-life survey, at 12 months</b> with <a href="#">open mesh repair</a> with expectant management Consistent improvement in all dimensions (except the emotional role)	Mean difference 7 95% CI 0 to 14 P = 0.039 See further information on studies for discussion of generalisability of results	○○○	open mesh repair

**Hospitalisation**

No data from the following reference on this outcome. [6] [7]

**Return to normal activities/work**

No data from the following reference on this outcome. <sup>[6]</sup> <sup>[7]</sup>

**Recurrence**

No data from the following reference on this outcome. <sup>[6]</sup> <sup>[7]</sup>

**Adverse effects**

Ref (type)	Population	Outcome, Interventions	Results and statistical analysis	Effect size	Favours
<b>Adverse effects</b>					
<sup>[6]</sup> RCT	720 men; 619 unilateral, 77 recurrent	<p><b>Adverse effects</b></p> <p>with <a href="#">open mesh repair</a></p> <p>with expectant management</p> <p>Similar rates of surgical complications were reported between groups in people who had surgery: 22% in people with surgical repair v 28% in people assigned to watchful waiting who crossed over to surgical repair, P = 0.30</p> <p>One reported case of acute hernia incarceration with expectant management, which required surgical management</p>			
<sup>[7]</sup> RCT	160 men; 147 unilateral, 4 recurrent	<p><b>Adverse effects</b></p> <p>with open mesh repair</p> <p>with expectant management</p> <p>Complication rates not reported</p> <p>One acute presentation of a hernia in the observation group that required surgery</p>			

**Open mesh repair versus open suture repair:**

We found one systematic review (search date 2000) <sup>[8]</sup> and four subsequent RCTs. <sup>[9]</sup> <sup>[10]</sup> <sup>[11]</sup> <sup>[12]</sup> The systematic review included people with unilateral, bilateral, or recurrent femoral or inguinal hernia. Separate meta-analyses were performed in people with recurrent or bilateral hernia and are presented in this review (see questions on primary bilateral inguinal hernia in adults and recurrent inguinal hernia in adults). <sup>[8]</sup>

**Pain**

*Open mesh repair compared with open suture repair* We don't know how [open mesh repair](#) and [open suture repair](#) compare at reducing continuing pain at 3 months ([low-quality evidence](#)).

Ref (type)	Population	Outcome, Interventions	Results and statistical analysis	Effect size	Favours
<b>Pain</b>					
<sup>[8]</sup> Systematic review	2393 people 9 RCTs in this analysis	<b>Persisting pain , after 3 months</b> 63/1213 (5%) with <a href="#">open mesh repair</a>	OR 0.68 95% CI 0.47 to 0.98		open mesh repair

Ref (type)	Population	Outcome, Interventions	Results and statistical analysis	Effect size	Favours
		84/1180 (7%) with <a href="#">open suture repair</a>	Results were heterogeneous and influenced by data from one RCT. After adjustment for heterogeneity, difference between groups was not significant; see further information on studies for full details		

No data from the following reference on this outcome. <sup>[9]</sup> <sup>[12]</sup> <sup>[11]</sup> <sup>[10]</sup>

**Hospitalisation**

*Open mesh repair compared with open suture repair* [Open mesh repair](#) may be marginally more effective than [open suture repair](#) at reducing length of hospital stay, but we don't know whether it is more effective at reducing operating time (*very low-quality evidence*).

Ref (type)	Population	Outcome, Interventions	Results and statistical analysis	Effect size	Favours
<b>Hospital stay</b>					
<sup>[8]</sup> Systematic review	3733 people 17 RCTs in this analysis	<b>Duration of hospital stay</b> with <a href="#">open mesh repair</a> with <a href="#">open suture repair</a>	WMR in length of stay: 0.28 days 95% CI 0.22 to 0.35  The difference in hospital stay was small and may be of limited importance to people having surgery		open mesh repair
<b>Operation duration</b>					
<sup>[10]</sup> RCT	106 people; 100 primary hernias, 6 recurrent hernias	<b>Operating time</b> 33 minutes with <a href="#">open mesh repair</a> 49 minutes with <a href="#">open suture repair</a>	P <0.05  See further information on studies for details on generalisability and power		open mesh repair
<sup>[11]</sup> RCT	196 men; 216 primary inguinal hernias	<b>Time taken for repair</b> 55.34 minutes with open mesh repair 59.34 minutes with open suture repair	P >0.05  See further information on studies for details on generalisability and power		Not significant

No data from the following reference on this outcome. <sup>[9]</sup> <sup>[12]</sup>

**Return to normal activities/work**

*Open mesh repair compared with open suture repair* We don't know how [open mesh repair](#) and [open suture repair](#) compare at reducing time to return to normal activity or work (*very low-quality evidence*).

Ref (type)	Population	Outcome, Interventions	Results and statistical analysis	Effect size	Favours
<b>Return to normal activities/work</b>					
<sup>[8]</sup> Systematic review	1279 people 8 RCTs in this analysis	<b>Time to usual activities , after 3 months</b> with <a href="#">open mesh repair</a> with <a href="#">open suture repair</a>	HR 0.81 95% CI 0.73 to 0.91  Results were heterogeneous and influenced by data from one RCT. After adjustment for heterogeneity, difference between groups was not significant; see further information on studies for full details		open mesh repair

Ref (type)	Population	Outcome, Interventions	Results and statistical analysis	Effect size	Favours
[9] RCT	100 men; 5 bilateral hernias	<b>Time to return to normal activity</b> 5.1 weeks with open mesh repair 5.1 weeks with open suture repair	Difference 0 weeks 95% CI -1.6 weeks to +1.6 weeks See further information on studies for details on generalisability and power	↔	Not significant
[10] RCT	106 people; 100 primary hernias, 6 recurrent hernias	<b>Time off work</b> 15 days with open mesh repair 25 days with open suture repair	P <0.01 See further information on studies for details on generalisability and power	○○○	open mesh repair
[11] RCT	196 men; 216 primary inguinal hernias	<b>Time to return to work</b> 21.39 days with open mesh repair 28.24 days with open suture repair	P <0.05 See further information on studies for details on generalisability and power	○○○	open mesh repair

No data from the following reference on this outcome. [12]

**Recurrence**

*Open mesh repair compared with open suture repair* We don't know how [open mesh repair](#) and [open suture repair](#) compare at reducing hernia recurrence ([low-quality evidence](#)).

Ref (type)	Population	Outcome, Interventions	Results and statistical analysis	Effect size	Favours
<b>Recurrence</b>					
[8] Systematic review	4532 people, predominantly with unilateral hernia 18 RCTs in this analysis	<b>Recurrence</b> with <a href="#">open mesh repair</a> with <a href="#">open suture repair</a>	OR 0.37 95% CI 0.26 to 0.51	●●○	open mesh repair
[9] RCT	100 men; 5 bilateral hernias	<b>Number of hernia recurrences, 4 years</b> 2 with open mesh repair 2 with open suture repair	Significance not assessed See further information on studies for details on generalisability and power		
[10] RCT	106 people; 100 primary hernias, 6 recurrent hernias	<b>Recurrence</b> 0/54 (0%) with open mesh repair 1/52 (2%) with open suture repair	P = 0.08 See further information on studies for details on generalisability and power	↔	Not significant
[11] RCT	196 men; 216 primary inguinal hernias	<b>Hernia recurrence</b> 5 with open mesh repair 8 with open suture repair	P >0.05 See further information on studies for details on generalisability and power	↔	Not significant
[12] RCT <b>3-armed trial</b>	280 men with primary inguinal hernias The remaining arm evaluated <a href="#">transabdominal preperitoneal (TAPP) repair</a>	<b>Recurrence</b> 1 with open mesh repair 6 with open suture repair	P = 0.055 for open mesh v open suture repair See further information on studies for details on generalisability and power	↔	Not significant

**Hernia complications**



No data from the following reference on this outcome. <sup>[8]</sup> <sup>[9]</sup> <sup>[10]</sup> <sup>[11]</sup> <sup>[12]</sup>

**Quality of life**

No data from the following reference on this outcome. <sup>[8]</sup> <sup>[9]</sup> <sup>[10]</sup> <sup>[11]</sup> <sup>[12]</sup>

**Adverse effects**

*Open mesh repair compared with open suture repair* Open mesh repair and open suture repair may be associated with a similar risk of surgical complications, such as haematoma, seroma, infection, numbness, and mortality, and a similar risk of postoperative pain (low-quality evidence).

Ref (type)	Population	Outcome, Interventions	Results and statistical analysis	Effect size	Favours
<b>Mortality</b>					
<sup>[8]</sup> Systematic review	1564 people 6 RCTs in this analysis	<b>Mortality</b> with open mesh repair with open suture repair  Serious events and death were rare in both groups	OR 1.35 95% CI 0.65 to 2.80	↔	Not significant
<b>Haematoma</b>					
<sup>[8]</sup> Systematic review	3072 people 13 RCTs in this analysis	<b>Haematoma</b> with open mesh repair with open suture repair	OR 0.93 95% CI 0.68 to 1.26	↔	Not significant
<sup>[9]</sup> RCT	100 men; 5 bilateral hernias	<b>Haematoma</b> 13% with open mesh repair 14% with open suture repair	Reported as not significant P value not reported	↔	Not significant
<b>Seroma</b>					
<sup>[8]</sup> Systematic review	3045 people 11 RCTs in this analysis	<b>Seroma</b> with open mesh repair with open suture repair	OR 1.52 95% CI 0.92 to 2.52	↔	Not significant
<sup>[9]</sup> RCT	100 men; 5 bilateral hernias	<b>Seroma</b> 2% with open mesh repair 4% with open suture repair	Reported as not significant P value not reported	↔	Not significant
<b>Infection</b>					
<sup>[8]</sup> Systematic review	3516 people 16 RCTs in this analysis	<b>Infection</b> with open mesh repair with open suture repair	OR 1.24 95% CI 0.84 to 1.84	↔	Not significant
<sup>[9]</sup> RCT	100 men; 5 bilateral hernias	<b>Infection</b> 4% with open mesh repair 2% with open suture repair	Reported as not significant P value not reported	↔	Not significant
<b>Complications</b>					
<sup>[8]</sup> Systematic review	3508 people 14 RCTs in this analysis	<b>Life-threatening surgical complications</b> with open mesh repair with open suture repair	OR 1.00 95% CI 0.20 to 4.95	↔	Not significant

Ref (type)	Population	Outcome, Interventions	Results and statistical analysis	Effect size	Favours
[10] RCT	106 people; 100 primary hernias, 6 recurrent hernias	<b>Overall complication rates</b> 7% with open mesh repair 13% with open suture repair	RR 0.57 95% CI 0.17 to 1.77 P = 0.4	↔	Not significant
<b>Numbness</b>					
[8] Systematic review	602 people 3 RCTs in this analysis	<b>Persisting numbness , after 3 months</b> with open mesh repair with open suture repair	OR 0.70 95% CI 0.29 to 1.72	↔	Not significant
[12] RCT <b>3-armed trial</b>	280 men with primary inguinal hernias The remaining arm evaluated transabdominal preperitoneal (TAPP) repair	<b>Rates of nerve injury leading to numbness</b> 14.5% with open mesh repair 12.2% with open suture repair	Significance not assessed		
<b>Postoperative pain</b>					
[10] RCT	106 people; 100 primary hernias, 6 recurrent hernias	<b>Analgesic requirement (paracetamol dose) , first postoperative week</b> 3.9 grams with open mesh repair 5.0 grams with open suture repair	P <0.03	○○○	open mesh repair
[10] RCT	106 people; 100 primary hernias, 6 recurrent hernias	<b>Postoperative pain scores (measured using visual analogue scale [0 = no pain; 100 = unbearable pain]) , at 14 days</b> 1 with open mesh repair 2 with open suture repair	P <0.01	○○○	open mesh repair
[11] RCT	196 men; 216 primary inguinal hernias	<b>Pain score , evening of the operative day</b> 6 with open mesh repair 6.08 with open suture repair	P >0.05	↔	Not significant

### Open mesh repair versus transabdominal preperitoneal (TAPP) laparoscopic repair:

See option on TAPP laparoscopic repair, p 22 .

### Open mesh repair versus totally extraperitoneal (TEP) laparoscopic repair:

See option on TEP laparoscopic repair, p 11 .

### Further information on studies

[6] **Generalisability** The RCT did not analyse results separately for people with recurrent or bilateral hernias. However, because most people presented with primary unilateral hernia, results are applicable to people with unilateral inguinal hernia. The RCT included men with only minimally symptomatic hernias; hence, these results

are applicable only to people with minimal symptoms. **Crossover** Of note, 23% of men assigned to expectant management received surgical repair because of an increase in hernia-related pain. Self-reported pain scores in this subgroup improved following surgical repair (data not reported). Conversely, 17% of men assigned to operative repair crossed over to expectant management. **As-treated analysis** Analysis of data based on treatment received found no significant difference between groups in proportion of people with pain that limited normal activity (1.46% with open mesh repair v 3.94% with expectant management; RD 2.88%, 95% CI -0.98% to +5.94%) or in quality-of-life score (+0.66 with open mesh repair v -0.62 with expectant management; difference -1.27, 95% CI -2.98 to +0.44; P = 0.79).

- [7] **Generalisability** The RCT did not analyse results separately for people with recurrent or bilateral hernias. However, because most people presented with primary unilateral hernia, results are applicable to people with unilateral inguinal hernia. The RCT included men with only minimally symptomatic hernias; hence, these results are applicable only to people with minimal symptoms. **Crossover** In the observation group, 23 men (29%) ended up with surgical repair because of increasing pain (11), hernia size (8), hernia affecting work or leisure (3), or acute presentation (1).
- [8] **Results adjusted for heterogeneity** The systematic review found that the results on continuing postoperative pain and time to return to usual activities were heterogeneous and influenced by the results of one RCT. When the analyses were adjusted for heterogeneity, the results were no longer significant (persisting pain: random effects model; OR 0.86, 95% CI 0.43 to 1.73; time to usual activities: sensitivity analysis excluding 1 RCT; HR 0.89, 95% CI 0.80 to 1.00). The heterogeneous RCT results within the review suggest that the outcome effects may be dependent on factors other than surgical method alone, and may include use of different variants of suturing and mesh repair, participant characteristics, experience of operating surgeons, or methods of outcome measurement among studies.
- [9] [10] [11] [12] The RCTs included a small proportion of men with either recurrent or bilateral inguinal hernia, and did not present results separately in men with unilateral hernia. However, the numbers of people with bilateral or recurrent hernias were small, and the number with femoral hernia in the systematic review was negligible. The overall results are therefore applicable to people with unilateral inguinal hernia. The RCTs were small compared with the systematic review, and probably lacked power to detect clinically important differences in recurrence rate between groups.

**Comment:**

**Clinical guide:**

Most clinicians believe surgical intervention to be the first-line treatment for inguinal hernia. However, there is some (albeit limited) evidence that watchful waiting (expectant management) is a safe option for men with minimally symptomatic or asymptomatic unilateral inguinal hernia. However, if these hernias become symptomatic they should be repaired. There is strong evidence that open mesh repair significantly reduces recurrence rates compared with open suture repair, but there is no significant difference in perioperative complication rates between the two methods.

**OPTION** **TOTALLY EXTRAPERITONEAL (TEP) LAPAROSCOPIC REPAIR FOR UNILATERAL INGUINAL HERNIA**

- For GRADE evaluation of interventions for Inguinal hernia, see table, p 60 .
- **Totally extraperitoneal (TEP) laparoscopic repair** may lead to less pain, faster recovery, and similar recurrence rates compared with open mesh repair, but studies have given inconclusive results.
- We found no direct information from RCTs about whether or not TEP laparoscopic repair is better than no active intervention (expectant management).

**Benefits and harms**

**TEP laparoscopic repair versus expectant management:**

We found no systematic review, RCTs, or cohort studies of sufficient quality comparing **TEP laparoscopic repair** versus expectant management.

**TEP laparoscopic repair versus open suture repair:**

We found one systematic review (search date 2002) [15] and one subsequent RCT [16] comparing **TEP laparoscopic repair** versus **open suture repair**. The systematic review excluded people with non-inguinal hernias. Although the review included patients with bilateral and recurrent inguinal hernias, the proportion was small, and the overall results are therefore applicable to people with unilateral inguinal hernia. Separate meta-analyses were performed for recurrent

and bilateral hernia and are presented in this review (see questions on primary bilateral inguinal hernia in adults and recurrent inguinal hernia in adults).

## Pain

*TEP laparoscopic repair compared with open suture repair* TEP laparoscopic repair may be more effective than open suture repair at reducing persisting pain at 3 months, but not groin pain at 2 years (low-quality evidence).

Ref (type)	Population	Outcome, Interventions	Results and statistical analysis	Effect size	Favours
<b>Pain</b>					
[15] Systematic review	515 people 2 RCTs in this analysis	<b>Persisting pain , after 3 months</b> with TEP laparoscopic repair with open suture repair	OR 0.22 95% CI 0.14 to 0.35 Data analysed using fixed-effects model; see further information on studies for full details		TEP laparoscopic repair
[16] RCT	261 people RCT included a minority of people with recurrent and bilateral inguinal hernia and femoral hernia	<b>Groin pain , after 2 years</b> 14/119 (12%) with TEP laparoscopic repair 8/125 (6%) with open suture repair	P >0.05		Not significant

## Hospitalisation

*TEP laparoscopic repair compared with open suture repair* TEP laparoscopic repair may be marginally more effective than open suture repair at reducing the length of hospital stay (low-quality evidence).

Ref (type)	Population	Outcome, Interventions	Results and statistical analysis	Effect size	Favours
<b>Hospital stay</b>					
[15] Systematic review	1338 people 4 RCTs in this analysis	<b>Length of hospital stay</b> with TEP laparoscopic repair with open suture repair	WMD in length of stay: 0.34 days 95% CI 0.22 days to 0.45 days		TEP laparoscopic repair
[16] RCT	261 people RCT included a minority of people with recurrent and bilateral inguinal hernia and femoral hernia	<b>Median hospital stay</b> 1 day with laparoscopic repair 1 day with open suture repair	Reported as not significant P value not reported		Not significant

## Return to normal activities/work

*TEP laparoscopic repair compared with open suture repair* TEP laparoscopic repair seems no more effective than open suture repair at reducing the time to return to normal activities (moderate-quality evidence).

Ref (type)	Population	Outcome, Interventions	Results and statistical analysis	Effect size	Favours
<b>Return to normal activities/work</b>					
[15] Systematic review	94 people Data from 1 RCT	<b>Time to return to normal activities</b> with TEP laparoscopic repair with open suture repair	HR 0.78 95% CI 0.52 to 1.17 Data analysed using fixed-effects model; see further information on studies for full details		Not significant

No data from the following reference on this outcome. [16]

**Recurrence**

TEP laparoscopic repair compared with open suture repair TEP laparoscopic repair and open suture repair seem equally effective at reducing hernia recurrence (moderate-quality evidence).

Ref (type)	Population	Outcome, Interventions	Results and statistical analysis	Effect size	Favours
<b>Recurrence</b>					
[15] Systematic review	1519 people 5 RCTs in this analysis	<b>Recurrence</b> with TEP laparoscopic repair with open suture repair	OR 0.67 95% CI 0.38 to 1.18 Data analysed using fixed-effects model; see further information on studies for full details	↔	Not significant
[16] RCT	261 people RCT included a minority of people with recurrent and bilateral inguinal hernia and femoral hernia	<b>Recurrence , after 2 years</b> 5/119 (4%) with TEP laparoscopic repair 0/125 (0%) with open suture repair	P >0.05	↔	Not significant

**Hernia complications**

No data from the following reference on this outcome. [15] [16]

**Quality of life**

No data from the following reference on this outcome. [15] [16]

**Adverse effects**

TEP laparoscopic repair compared with open suture repair TEP laparoscopic repair seems to be associated with a lower rate of superficial infection but a higher rate of seroma than open suture repair. TEP laparoscopic repair and open suture repair seem to be associated with similar rates of haematoma and vascular injury (moderate-quality evidence).

Ref (type)	Population	Outcome, Interventions	Results and statistical analysis	Effect size	Favours
<b>Complications (general)</b>					
[16] RCT	261 people RCT included a minority of people with recurrent and bilateral inguinal hernia and femoral hernia	<b>Complications (general) , after 2 years</b> 7 with TEP laparoscopic repair 4 with open suture repair In the TEP group, 6 people had severe pain and 1 person had epididymitis In the open suture group, 2 people had severe pain, 1 person had gastroenteritis, and 1 person had a fever of unknown cause	P value not reported	↔	Not significant
<b>Haematoma</b>					
[15] Systematic review	1337 people 3 RCTs in this analysis	<b>Haematoma</b> with TEP laparoscopic repair	OR 1.27 95% CI 0.70 to 2.33	↔	Not significant

Ref (type)	Population	Outcome, Interventions	Results and statistical analysis	Effect size	Favours
		with <a href="#">open suture repair</a>	Data analysed using fixed-effects model; see further information on studies for full details		
<b>Injury</b>					
[15] Systematic review	1279 people 3 RCTs in this analysis	<b>Vascular injury</b> with <a href="#">TEP laparoscopic repair</a> with <a href="#">open suture repair</a>	OR 0.55 95% CI 0.06 to 5.30 Data analysed using fixed-effects model; see further information on studies for full details	↔	Not significant
[15] Systematic review	1098 people 2 RCTs in this analysis	<b>Visceral injury</b> 0 with TEP laparoscopic repair 0 with open suture repair			
<b>Seroma</b>					
[15] Systematic review	1279 people 3 RCTs in this analysis	<b>Seroma</b> with <a href="#">TEP laparoscopic repair</a> with <a href="#">open suture repair</a>	OR 7.65 95% CI 2.33 to 25.09 Data analysed using fixed-effects model; see further information on studies for full details	●●●	open suture repair
<b>Infection</b>					
[15] Systematic review	1279 people 3 RCTs in this analysis	<b>Superficial infection</b> with <a href="#">TEP laparoscopic repair</a> with <a href="#">open suture repair</a>	OR 0.14 95% CI 0.03 to 0.61 Data analysed using fixed-effects model; see further information on studies for full details	●●●	TEP laparoscopic repair
[15] Systematic review	1098 people 2 RCTs in this analysis	<b>Deep infection</b> 0 with TEP laparoscopic repair 0 with open suture repair			

**TEP laparoscopic repair versus open mesh repair:**

We found one systematic review (search date 2003) [17] and three subsequent RCTs [13] [14] [18] comparing [TEP laparoscopic repair](#) versus [open mesh repair](#). We also found one long-term follow-up of one of the studies included in the review, which pooled results of three RCTs comparing TEP laparoscopic repair, small mesh [transabdominal preperitoneal \(TAPP\) laparoscopic repair](#), large mesh TAPP laparoscopic repair, and open mesh repair (see further information on studies). [19]

**Pain**

*TEP laparoscopic repair compared with open mesh repair* [TEP laparoscopic repair](#) seems more effective than [open mesh repair](#) at reducing persisting pain and pain at 12 weeks post surgery ([moderate-quality evidence](#)).

Ref (type)	Population	Outcome, Interventions	Results and statistical analysis	Effect size	Favours
<b>Pain</b>					
[17] Systematic review	991 people 4 RCTs in this analysis	<b>Persisting pain</b> with <a href="#">TEP laparoscopic repair</a> with <a href="#">open mesh repair</a>	RR 0.77 95% CI 0.64 to 0.94 Data analysed using fixed-effects model; see further information on studies for full details	●○○	TEP laparoscopic repair

Ref (type)	Population	Outcome, Interventions	Results and statistical analysis	Effect size	Favours
[13] RCT	1371 men with primary unilateral hernia	<b>Analgesic requirement , 12 weeks</b> with TEP laparoscopic repair with open mesh repair See further information on studies for details of conversion rate	P = 0.011		TEP laparoscopic repair

No data from the following reference on this outcome. [14] [18]

**Hospitalisation**

*TEP laparoscopic repair compared with open mesh repair* TEP laparoscopic repair may be more effective than open mesh repair at reducing the overall length of hospital stay, but not at reducing the duration of operation or the proportion of people discharged within 24 hours (low-quality evidence).

Ref (type)	Population	Outcome, Interventions	Results and statistical analysis	Effect size	Favours
<b>Hospital stay</b>					
[17] Systematic review	1227 people 8 RCTs in this analysis	<b>Length of hospital stay</b> with TEP laparoscopic repair with open mesh repair	WMD -0.12 days 95% CI -0.06 days to -0.18 days The difference was small Data analysed using fixed-effects model; see further information on studies for full details Heterogeneity among RCTs; see further information on studies		TEP laparoscopic repair
[18] RCT	140 people	<b>Length of hospital stay</b> 2 days with TEP laparoscopic repair 2 days with open mesh repair	P >0.05		Not significant
[13] RCT	1371 men with primary unilateral hernia	<b>Discharge from the hospital , within 24 hours</b> 100% with TEP laparoscopic repair 99.1% with open mesh repair See further information on studies for details of conversion rate	Significance not assessed		
<b>Duration of operation</b>					
[13] RCT	1371 men with primary unilateral hernia	<b>Median duration of operation</b> 55 minutes with TEP laparoscopic repair 55 minutes with open mesh repair See further information on studies for details of conversion rate	Significance not assessed		
[14] RCT <b>3-armed trial</b>	66 men with primary unilateral hernia The remaining arm evaluated TAPP laparoscopic repair	<b>Operative times</b> with TEP laparoscopic repair with open mesh repair Absolute results not reported The RCT reported that TEP laparoscopic repair and open mesh repair had equivalent operative times	Significance not assessed		

Ref (type)	Population	Outcome, Interventions	Results and statistical analysis	Effect size	Favours
		See further information on studies for details of conversion rate			

**Return to normal activities/work**

*TEP laparoscopic repair compared with open mesh repair* TEP laparoscopic repair may be more effective than open mesh repair at reducing the time to return to normal activities or work (low-quality evidence).

Ref (type)	Population	Outcome, Interventions	Results and statistical analysis	Effect size	Favours
<b>Return to normal activities/work</b>					
[17] Systematic review	836 people 7 RCTs in this analysis	<b>Time to return to normal activities</b> with TEP laparoscopic repair with open mesh repair	HR 0.49 95% CI 0.42 to 0.56 Data analysed using fixed-effects model; see further information on studies for full details		TEP laparoscopic repair
[18] RCT	140 people	<b>Time to return to work</b> 13 days with TEP laparoscopic repair 18 days with open mesh repair	P <0.05		TEP laparoscopic repair
[13] RCT	1371 men with primary unilateral hernia	<b>Median sick leave</b> 7 (range 0–77) with TEP laparoscopic repair 12 (range 0–55) with open mesh repair See further information on studies for details of conversion rate	P <0.001		TEP laparoscopic repair
[14] RCT 3-armed trial	66 men with primary unilateral hernia	<b>Lost work days</b> with TEP laparoscopic repair with TAPP laparoscopic repair with open mesh repair Absolute results not reported See further information on studies for details of conversion rate	P among the groups = 0.074		

**Recurrence**

*TEP laparoscopic repair compared with open mesh repair* TEP laparoscopic repair and open mesh repair seem equally effective at preventing hernia recurrence (moderate-quality evidence).

Ref (type)	Population	Outcome, Interventions	Results and statistical analysis	Effect size	Favours
<b>Recurrence</b>					
[17] Systematic review	2009 people 13 RCTs in this analysis	<b>Recurrence</b> with TEP laparoscopic repair with open mesh repair	RR 1.61 95% CI 0.87 to 2.98		Not significant
[18] RCT	140 people	<b>Recurrence, median follow-up of 18 months</b> 0 with TEP laparoscopic repair 0 with open mesh repair	P >0.05		Not significant
[13] RCT	1371 men with primary unilateral hernia	<b>Recurrence, at 3 months</b> 5 with TEP laparoscopic repair	Significance not assessed		



Ref (type)	Population	Outcome, Interventions	Results and statistical analysis	Effect size	Favours
		0 with open mesh repair 4 of the surgeries resulting in recurrence were performed by one surgeon, all occurring within his first 12 surgeries See further information on studies for details of conversion rate			
[14] RCT 3-armed trial	66 men with primary unilateral hernia The remaining arm evaluated TAPP laparoscopic repair	<b>Recurrence , within 24 months</b> 1 with TEP laparoscopic repair 0 with open mesh repair The RCT reported that recurrence occurred because of an inadequate mesh size See further information on studies for details of conversion rate	Significance not assessed		

**Hernia complications**

No data from the following reference on this outcome. [17] [13] [14] [18]

**Quality of life**

No data from the following reference on this outcome. [17] [13] [14] [18]

**Adverse effects**

*TEP laparoscopic repair compared with open mesh repair* TEP laparoscopic repair seems to be associated with a lower rate of haematoma and persisting numbness at 1 year, but not of seroma or superficial infection. TEP laparoscopic repair may be more effective than open mesh repair at reducing postoperative pain and analgaesic requirement (moderate-quality evidence).

Ref (type)	Population	Outcome, Interventions	Results and statistical analysis	Effect size	Favours
<b>Postoperative complications (general)</b>					
[18] RCT	140 people	<b>Postoperative complications</b> 17/61 (28%) with TEP laparoscopic repair 16/62 (26%) with open mesh repair Postoperative complications included urinary retention, haematoma, seroma, hydrocele, wound infection, wound erythema, persistent pain, and paraesthesia	Reported as not significant P value not reported	↔	Not significant
<b>Haematoma</b>					
[17] Systematic review	1593 people 9 RCTs in this analysis	<b>Haematoma</b> with TEP laparoscopic repair with open mesh repair	RR 0.44 95% CI 0.33 to 0.58 Data analysed using fixed-effects model; see further information on studies for full details		TEP laparoscopic repair

Ref (type)	Population	Outcome, Interventions	Results and statistical analysis	Effect size	Favours
[13] RCT	1371 men with primary unilateral hernia	<b>Haematoma</b> 10.5% with TEP laparoscopic repair 12.9% with open mesh repair See further information on studies for details of conversion rate	P = 0.184	↔	Not significant
<b>Numbness</b>					
[17] Systematic review	906 people 4 RCTs in this analysis	<b>Persisting numbness , at 1 year</b> with TEP laparoscopic repair with open mesh repair	RR 0.67 95% CI 0.53 to 0.86 Data analysed using fixed-effects model; see further information on studies for full details	●○○	TEP laparoscopic repair
[13] RCT	1371 men with primary unilateral hernia	<b>Numbness , at 3 months</b> 3 patients with TEP laparoscopic repair 22 patients with open mesh repair See further information on studies for details of conversion rate	P <0.001	○○○	TEP laparoscopic repair
<b>Seroma</b>					
[17] Systematic review	1609 people 9 RCTs in this analysis	<b>Seroma</b> with TEP laparoscopic repair with open mesh repair	RR 0.73 95% CI 0.46 to 1.14 Data analysed using fixed-effects model; see further information on studies for full details	↔	Not significant
[13] RCT	1371 men with primary unilateral hernia	<b>Seroma</b> 0.9% with TEP laparoscopic repair 0.8% with open mesh repair See further information on studies for details of conversion rate	P = 1.00	↔	Not significant
<b>Infection</b>					
[17] Systematic review	1749 people 10 RCTs in this analysis	<b>Superficial infection</b> with TEP laparoscopic repair with open mesh repair	RR 0.62 95% CI 0.33 to 1.16 Data analysed using fixed-effects model; see further information on studies for full details	↔	Not significant
[17] Systematic review	1056 people	<b>Deep infection</b> with TEP laparoscopic repair with open mesh repair Only one case of deep infection (0.1%) was reported with either TEP laparoscopic repair or open mesh repair			
[13] RCT	1371 men with primary unilateral hernia	<b>Infection</b> 1.45% with TEP laparoscopic repair 0.7% with open mesh repair See further information on studies for details of conversion rate	P = 0.206	↔	Not significant

Ref (type)	Population	Outcome, Interventions	Results and statistical analysis	Effect size	Favours
<b>Urinary tract discomfort</b>					
[13] RCT	1371 men with primary unilateral hernia	<b>Urinary tract discomfort</b> 0.95% with TEP laparoscopic repair 1.0% with open mesh repair See further information on studies for details of conversion rate	P = 1.00	↔	Not significant
<b>Injury</b>					
[17] Systematic review	1461 people	<b>Vascular injury</b> with TEP laparoscopic repair with open mesh repair Only 8 cases of vascular injury (0.6%) were reported with either TEP laparoscopic repair or open mesh repair			
[17] Systematic review	1274 people	<b>Visceral injury</b> with TEP laparoscopic repair with open mesh repair Only 3 cases of visceral injury (0.2%) were reported with either TEP laparoscopic repair or open mesh repair			
<b>Postoperative pain</b>					
[18] RCT	140 people	<b>Need for postoperative analgesia (number of postoperative analgesic injections)</b> 3.7 with TEP laparoscopic repair 4.3 with open mesh repair	P >0.05	↔	Not significant
[18] RCT	140 people	<b>Need for postoperative analgesia (days of oral analgesia)</b> 2 days with TEP laparoscopic repair 2 days with open mesh repair	P >0.05	↔	Not significant
[13] RCT	1371 men with primary unilateral hernia	<b>Postoperative pain (visual analogue score)</b> with TEP laparoscopic repair with open mesh repair See further information on studies for details of conversion rate	P <0.001	○○○	TEP laparoscopic repair
[13] RCT	1371 men with primary unilateral hernia	<b>Postoperative analgesic requirement</b> with TEP laparoscopic repair with open mesh repair See further information on studies for details of conversion rate	P <0.001	○○○	TEP laparoscopic repair

No data from the following reference on this outcome. [14]

**TEP laparoscopic repair versus TAPP laparoscopic repair:**

We found one systematic review (search date 2003, 1 RCT, 52 people) <sup>[20]</sup> and one subsequent RCT. <sup>[14]</sup>

**Hospitalisation**

*TEP laparoscopic repair compared with TAPP laparoscopic repair* We don't know how TEP and TAPP laparoscopic repair compare at reducing duration of operation, time off work, or length of hospital stay (*very low-quality evidence*).

Ref (type)	Population	Outcome, Interventions	Results and statistical analysis	Effect size	Favours
<b>Hospital stay</b>					
<sup>[20]</sup> Systematic review	52 men Data from 1 RCT	<b>Length of hospital stay (mean number of days)</b> 4.4 with TEP laparoscopic repair 3.7 with TAPP laparoscopic repair	WMD -0.7 days 95% CI -1.33 days to -0.07 days P = 0.03	○○○	TAPP laparoscopic repair
<b>Duration of operation</b>					
<sup>[20]</sup> Systematic review	52 men Data from 1 RCT	<b>Duration of operation (minutes)</b> 52.3 with TEP laparoscopic repair 46.0 with TAPP laparoscopic repair	WMD -6.3 minutes 95% CI -12.82 minutes to +0.22 minutes P = 0.06	↔	Not significant
<sup>[14]</sup> RCT <b>3-armed trial</b>	66 men The remaining arm evaluated open mesh repair	<b>Time for repair</b> with TEP laparoscopic repair with TAPP laparoscopic repair Absolute results not reported Reported that TEP laparoscopic repair took less time than TAPP laparoscopic repair			

**Return to normal activities/work**

*TEP laparoscopic repair compared with TAPP laparoscopic repair* We don't know how TEP and TAPP laparoscopic repair compare at reducing time off work (*low-quality evidence*).

Ref (type)	Population	Outcome, Interventions	Results and statistical analysis	Effect size	Favours
<b>Time off work</b>					
<sup>[14]</sup> RCT <b>3-armed trial</b>	66 men	<b>Time off work</b> with TEP laparoscopic repair with TAPP laparoscopic repair with open mesh repair Absolute numbers not reported	P = 0.074 for among group difference		

**Recurrence**

*TEP laparoscopic repair compared with TAPP laparoscopic repair* We don't know how TEP and TAPP laparoscopic repair compare at reducing hernia recurrence (*low-quality evidence*).

Ref (type)	Population	Outcome, Interventions	Results and statistical analysis	Effect size	Favours
<b>Recurrence</b>					
<sup>[20]</sup> Systematic review	52 men Data from 1 RCT	<b>Hernia recurrence</b> 0/24 (0%) with TEP laparoscopic repair	RR 2.59 95% CI 0.11 to 60.69 P = 0.6	↔	Not significant

Ref (type)	Population	Outcome, Interventions	Results and statistical analysis	Effect size	Favours
		1/28 (4%) with TAPP laparoscopic repair			

**Pain**

No data from the following reference on this outcome. <sup>[20]</sup> <sup>[14]</sup>

**Hernia complications**

No data from the following reference on this outcome. <sup>[20]</sup> <sup>[14]</sup>

**Quality of life**

No data from the following reference on this outcome. <sup>[20]</sup> <sup>[14]</sup>

**Adverse effects**

Ref (type)	Population	Outcome, Interventions	Results and statistical analysis	Effect size	Favours
<b>Haematoma</b>					
<sup>[20]</sup> Systematic review	52 men Data from 1 RCT	<b>Haematoma formation</b> 0/24 (0%) with TEP laparoscopic repair 1/28 (4%) with TAPP laparoscopic repair	RR 2.59 95% 0.11 to 60.69 P = 0.6	↔	Not significant

No data from the following reference on this outcome. <sup>[14]</sup>

**Further information on studies**

<sup>[15]</sup> **Analysis of data** The review analysed data using the fixed-effects model, as opposed to the random-effects model, and this may have overestimated differences between the two treatments.

<sup>[19]</sup> The long-term follow-up found that laparoscopic repair significantly reduced the proportion of people with chronic pain at 5 years compared with open mesh repair, although results for TAPP and TEP laparoscopic repair were not reported separately (pain: 0/62 [0%] with TAPP or TEP laparoscopic repair v 4/59 [7%] with open mesh repair; difference -7, 95% CI -10 to -0.4; P = 0.04). It found lower rates of recurrence at 5 years with TEP laparoscopic repair compared with open mesh repair (123 people, 121 followed up; 0/22 [0%] with TEP laparoscopic repair v 2/59 [3%] with open mesh repair, significance not reported).

<sup>[13]</sup> There were 12 TEP conversions: eight to an open mesh repair, and four to a TAPP laparoscopic procedure. Reasons for conversion included gas leakage, adhesions, bleeding, and anatomical difficulties.

<sup>[14]</sup> There were two conversions from TEP to an open repair because of technical difficulties.

<sup>[17]</sup> **Analysis of data** The review analysed data using the fixed-effects model, as opposed to the random-effects model, and this may have overestimated differences between the two treatments. **Hospital stay** The review found heterogeneity among RCTs in length of hospital stay for TEP versus open mesh repair. There were greater differences in mean length of stay between different hospitals than between different operative techniques. This may suggest that overall findings reflect differences in healthcare systems as opposed to differences because of types of repair.

**Comment:** **Clinical guide:**  
TEP laparoscopic repair may lead to less pain and similar recurrence rates compared with open suture and open mesh repair. Complication rates seem to be similar between TEP laparoscopic repair and traditional open methods, although TEP repair was shown to have an increased risk of seroma and reduced risk of superficial infection compared with open suture repair.

**OPTION TRANSABDOMINAL PREPERITONEAL (TAPP) LAPAROSCOPIC REPAIR FOR UNILATERAL INGUINAL HERNIA**

- For GRADE evaluation of interventions for Inguinal hernia, see table, p 60 .
- Transabdominal preperitoneal (TAPP) laparoscopic repair reduces pain and speeds up recovery compared with open mesh repair, but both procedures have similar recurrence rates.
- We found no direct information from RCTs about whether or not TAPP laparoscopic repair is better than no active intervention (expectant management).

**Benefits and harms**

**TAPP laparoscopic repair versus expectant management:**

We found no systematic review, RCTs, or cohort studies of sufficient quality comparing TAPP laparoscopic repair versus expectant management.

**TAPP laparoscopic repair versus open suture repair:**

We found one systematic review (search date 2002)<sup>[15]</sup> and four subsequent RCTs, reported in six publications.<sup>[21]</sup><sup>[22]</sup> <sup>[23]</sup> <sup>[24]</sup> <sup>[12]</sup> <sup>[25]</sup> The systematic review excluded people with non-inguinal hernias, but it did include a small proportion of people with recurrent or bilateral hernias. The overall results are therefore applicable to people with unilateral inguinal hernia. Separate meta-analyses were performed for recurrent and bilateral hernia, and are presented in this review (see questions on primary bilateral inguinal hernia in adults and recurrent inguinal hernia in adults). One further report<sup>[25]</sup> of one subsequent RCT<sup>[23]</sup> reported on discomfort levels; see further information on studies for full details.

**Pain**

TAPP laparoscopic repair compared with open suture repair TAPP laparoscopic repair seems more effective than open suture repair at reducing persistent pain at 3 months (moderate-quality evidence).

Ref (type)	Population	Outcome, Interventions	Results and statistical analysis	Effect size	Favours
<b>Pain</b>					
<sup>[15]</sup> Systematic review	1233 people 8 RCTs in this analysis	<b>Persisting pain , after 3 months</b> with TAPP laparoscopic repair with open suture repair	OR 0.35 95% CI 0.24 to 0.50 Data analysed using fixed-effects model; see further information on studies for full details		TAPP laparoscopic repair

No data from the following reference on this outcome.<sup>[22]</sup> <sup>[24]</sup> <sup>[12]</sup> <sup>[25]</sup> <sup>[21]</sup> <sup>[23]</sup>

**Hospitalisation**

*TAPP laparoscopic repair compared with open suture repair* TAPP laparoscopic repair may be more effective than open suture repair at marginally reducing length of hospital stay (very low-quality evidence).

Ref (type)	Population	Outcome, Interventions	Results and statistical analysis	Effect size	Favours
<b>Hospital stay</b>					
[15] Systematic review	1586 people 13 RCTs in this analysis	<b>Length of hospital stay</b> with TAPP laparoscopic repair with open suture repair	WMR 0.10 days 95% CI 0.02 days to 0.17 days The effect on length of hospital stay was slight Data analysed using fixed-effects model; see further information on studies for full details Heterogeneity among RCTs; see further information on studies		TAPP laparoscopic repair

No data from the following reference on this outcome. [21] [22] [23] [12] [25] [24]

**Return to normal activities/work**

*TAPP laparoscopic repair compared with open suture repair* TAPP laparoscopic repair may be more effective than open suture repair at reducing the time taken to return to usual activities (very low-quality evidence).

Ref (type)	Population	Outcome, Interventions	Results and statistical analysis	Effect size	Favours
<b>Return to normal activities</b>					
[15] Systematic review	728 people 7 RCTs in this analysis	<b>Time to usual activities</b> with TAPP laparoscopic repair with open suture repair	HR 0.50 95% CI 0.43 to 0.58 Data analysed using fixed-effects model; see further information on studies for full details		TAPP laparoscopic repair
<b>Duration of sick leave</b>					
[23] RCT multicentre	1042 people with primary unilateral inguinal hernia	<b>Median duration of sick leave</b> 10 days with TAPP laparoscopic repair 14 days with open suture repair Loss to follow-up of 18% for this outcome	P <0.001		TAPP laparoscopic repair

No data from the following reference on this outcome. [21] [22] [24] [12] [25]

**Recurrence**

*TAPP laparoscopic repair compared with open suture repair* We don't know how TAPP laparoscopic repair and open suture repair compare at reducing hernia recurrence (low-quality evidence).

Ref (type)	Population	Outcome, Interventions	Results and statistical analysis	Effect size	Favours
<b>Recurrence</b>					
[15] Systematic review	2259 people 16 RCTs in this analysis	<b>Recurrence</b> with TAPP laparoscopic repair with open suture repair	OR 0.45 95% CI 0.28 to 0.72 Data analysed using fixed-effects model; see further information on studies for full details The review reported a lack of consistency in results for recur-		TAPP laparoscopic repair

Ref (type)	Population	Outcome, Interventions	Results and statistical analysis	Effect size	Favours
			rence among the included RCTs (see further information on studies)		
[22] RCT	176 people, 152 unilateral and 24 bilateral inguinal hernias	<b>Recurrence rate</b> 2/86 (2%) with TAPP laparoscopic repair 1/90 (1%) with open suture repair	Reported as not significant P value not reported The RCT may have lacked power to detect a clinically important difference	↔	Not significant
[23] RCT Multi-centre	1042 people with primary unilateral inguinal hernia	<b>Recurrence , 3 months</b> 1.2% with TAPP laparoscopic repair 0.6% with open suture repair	P = 0.339	↔	Not significant
[24] RCT	People with primary unilateral inguinal hernia Further report of reference [23]	<b>Cumulative recurrence rates , at 5 years</b> 30/454 (6.6%) with TAPP laparoscopic repair 31/466 (6.7%) with open suture repair	P >0.9	↔	Not significant
[12] RCT <b>3-armed trial</b>	280 men with primary inguinal hernia The remaining arm evaluated open mesh repair	<b>Number of recurrences , 4 years</b> 1 with TAPP laparoscopic repair 6 with open suture repair	P = 0.055 for TAPP laparoscopic repair versus open suture repair	↔	Not significant

No data from the following reference on this outcome. [21] [24] [25]

**Hernia complications**

No data from the following reference on this outcome. [15] [21] [22] [23] [24] [12] [25]

**Quality of life**

No data from the following reference on this outcome. [15] [21] [22] [23] [24] [12] [25]

**Adverse effects**

Ref (type)	Population	Outcome, Interventions	Results and statistical analysis	Effect size	Favours
<b>Haematoma or seroma</b>					
[15] Systematic review	2061 people 15 RCTs in this analysis	<b>Haematoma</b> with TAPP laparoscopic repair with open suture repair	OR 1.18 95% CI 0.81 to 1.73	↔	Not significant
[22] RCT	176 people, 152 unilateral and 24 bilateral hernias	<b>Haematoma and seroma</b>	Significance not assessed		



Ref (type)	Population	Outcome, Interventions	Results and statistical analysis	Effect size	Favours
		4% with TAPP laparoscopic repair 3% with open suture repair	RCT may have lacked power to detect clinically important differences		
[23] [24] RCT Multi-centre	1042 people with primary unilateral inguinal hernia	<b>Haematoma and seroma</b> 9.1% with TAPP laparoscopic repair 14.7% with open suture repair	P <0.01		TAPP laparoscopic repair
[15] Systematic review	1424 people 10 RCTs in this analysis	<b>Seroma</b> with TAPP laparoscopic repair with open suture repair	OR 1.93 95% CI 1.25 to 2.99		open suture repair
<b>Infection</b>					
[15] Systematic review	1992 people 12 RCTs in this analysis	<b>Superficial infection</b> with TAPP laparoscopic repair with open suture repair	OR 0.47 95% CI 0.21 to 1.04		Not significant
[15] Systematic review	1248 people 7 RCTs in this analysis	<b>Deep infection</b> with TAPP laparoscopic repair with open suture repair	OR 0.98 95% CI 0.06 to 15.70		Not significant
[22] RCT	176 people; 152 unilateral and 24 bilateral hernias	<b>Wound infection</b> 1% with TAPP laparoscopic repair 2% with open suture repair	Significance not assessed RCT may have lacked power to detect clinically important differences		
<b>Numbness</b>					
[15] Systematic review	871 people 5 RCTs in this analysis	<b>Persisting numbness , after 3 months</b> with TAPP laparoscopic repair with open suture repair	OR 0.20 95% CI 0.09 to 0.43		TAPP laparoscopic repair
<b>Overall complications</b>					
[23] [24] RCT Multi-centre	1042 people with primary unilateral inguinal hernia	<b>Overall complication rate , at 1 week</b> 14.7% with TAPP laparoscopic repair 18.3% with open suture repair	P = 0.113		Not significant
<b>Postoperative pain</b>					
[23] RCT Multi-centre	1042 people with primary unilateral inguinal hernia	<b>Postoperative pain (determined by self-reporting using a visual analogue scale) , in the first week</b> with TAPP laparoscopic repair with open suture repair	P <0.001		TAPP laparoscopic repair
[21] RCT <b>3-armed trial</b>	280 people with primary hernias The remaining arm evaluated open mesh repair	<b>Absence of postoperative pain</b> 84% with TAPP laparoscopic repair 62% with open suture repair Pain measured on a self-report visual analogue scale	P <0.001		TAPP laparoscopic repair

No data from the following reference on this outcome. [21] [12]

**TAPP laparoscopic repair versus open mesh repair:**

We found one systematic review (search date 2003) <sup>[17]</sup> and four subsequent RCTs. <sup>[12] [14] [21] [26]</sup> We found a long-term follow-up of one of the studies included in the review, which pooled the results of three RCTs comparing small mesh TAPP laparoscopic repair, large mesh TAPP laparoscopic repair, and totally extraperitoneal (TEP) laparoscopic repair versus open mesh repair (see further information on studies). <sup>[19]</sup>

**Pain**

TAPP laparoscopic repair compared with open mesh repair TAPP laparoscopic repair seems more effective than open mesh repair at reducing the proportion of people with persisting pain at 1 year (moderate-quality evidence).

Ref (type)	Population	Outcome, Interventions	Results and statistical analysis	Effect size	Favours
<b>Pain</b>					
<sup>[17]</sup> Systematic review	1550 people 8 RCTs in this analysis	<b>Persisting pain , at 1 year</b> with TAPP laparoscopic repair with open mesh repair	RR 0.72 95% CI 0.56 to 0.88 Data analysed using fixed-effects model; see further information on studies for full details		TAPP laparoscopic repair

No data from the following reference on this outcome. <sup>[12] [14] [19] [21] [26]</sup>

**Hospitalisation**

TAPP laparoscopic repair compared with open mesh repair TAPP laparoscopic repair may be more effective than open mesh repair at reducing the length of hospital stay, but not operative time (low-quality evidence).

Ref (type)	Population	Outcome, Interventions	Results and statistical analysis	Effect size	Favours
<b>Hospital stay</b>					
<sup>[26]</sup> RCT	50 people	<b>Length of hospital stay</b> 1.52 days with TAPP laparoscopic repair 2.24 days with open mesh repair	P <0.05		TAPP laparoscopic repair
<b>Operation duration</b>					
<sup>[14]</sup> RCT 3-armed trial	66 people The remaining arm evaluated TEP laparoscopic repair	<b>Time to perform procedure</b> with TAPP laparoscopic repair with open mesh repair Absolute results not reported TAPP laparoscopic repair took more time to perform than open mesh repair	Significance not assessed		

No data from the following reference on this outcome. <sup>[17] [12] [14]</sup>

**Return to normal activities/work**

TAPP laparoscopic repair compared with open mesh repair TAPP laparoscopic repair may be more effective than open mesh repair at reducing the time to return to normal activities, but not in lost work days (low-quality evidence).

Ref (type)	Population	Outcome, Interventions	Results and statistical analysis	Effect size	Favours
<b>Return to normal activities</b>					
[17] Systematic review	1025 people 8 RCTs in this analysis	<b>Time to return to usual activities</b> with TAPP laparoscopic repair with open mesh repair	HR 0.66 95% CI 0.58 to 0.75 Data analysed using fixed-effects model; see further information on studies for full details		TAPP laparoscopic repair
<b>Lost work days</b>					
[14] RCT 3-armed trial	66 people	<b>Lost work days</b> with TAPP laparoscopic repair with TEP laparoscopic repair with open mesh repair Absolute results not reported	P = 0.074 for among-group difference		Not significant

No data from the following reference on this outcome. [12] [21] [26]

**Recurrence**

TAPP laparoscopic repair compared with open mesh repair TAPP laparoscopic repair and open mesh repair seem equally effective at preventing hernia recurrence (moderate-quality evidence).

Ref (type)	Population	Outcome, Interventions	Results and statistical analysis	Effect size	Favours
<b>Recurrence</b>					
[17] Systematic review	2114 people 15 RCTs in this analysis	<b>Hernia recurrence</b> with TAPP laparoscopic repair with open mesh repair	RR 1.18 95% CI 0.69 to 2.02 Data analysed using fixed-effects model; see further information on studies for full details		Not significant
[26] RCT	50 people	<b>Recurrence, mean follow-up 13.5 months</b> 0 with TAPP laparoscopic repair 0 with open mesh repair	Significance not assessed		
[21] RCT 3-armed trial	280 men The remaining arm evaluated open suture repair	<b>Recurrence</b> 1 with TAPP laparoscopic repair 1 with open mesh repair	Significance not assessed		

No data from the following reference on this outcome. [14] [21]

**Hernia complications**

No data from the following reference on this outcome. [17] [12] [14] [21] [26] [19]

**Quality of life**

No data from the following reference on this outcome. [17] [12] [14] [21]

**Adverse effects**

TAPP laparoscopic repair compared with open mesh repair TAPP laparoscopic repair may be more effective than open mesh repair at reducing the risk of persisting numbness, haematoma, superficial infection, and postoperative pain, but less effective at reducing the risk of seroma (low-quality evidence).

Ref (type)	Population	Outcome, Interventions	Results and statistical analysis	Effect size	Favours
<b>Haematoma</b>					
[17] Systematic review	1677 people 12 RCTs in this analysis	<b>Haematoma</b> with TAPP laparoscopic repair with open mesh repair	RR 0.76 95% CI 0.62 to 0.94 Data analysed using fixed-effects model; see further information on studies for full details Result was heavily influenced by 1 RCT, [27] and the difference was not significant when this trial was removed		TAPP laparoscopic repair
<b>Seroma</b>					
[17] Systematic review	1672 people 12 RCTs in this analysis	<b>Seroma</b> with TAPP laparoscopic repair with open mesh repair	RR 1.97 95% CI 1.27 to 3.07 Data analysed using fixed-effects model; see further information on studies for full details		open mesh repair
<b>Numbness</b>					
[17] Systematic review	1483 people 8 RCTs in this analysis	<b>Numbness</b> with TAPP laparoscopic repair with open mesh repair	RR 0.26 95% CI 0.17 to 0.40 Data analysed using fixed-effects model; see further information on studies for full details		TAPP laparoscopic repair
[14] RCT 3-armed trial	66 people The remaining arm evaluated TEP laparoscopic repair	<b>Numbness</b> with TAPP laparoscopic repair with open mesh repair Absolute results not reported The RCT reported that nerve damage with scrotal numbness was less common with TAPP repair compared with open mesh repair	Statistical analysis not reported		
<b>Infection</b>					
[17] Systematic review	1756 people 12 RCTs in this analysis	<b>Infection</b> with TAPP laparoscopic repair with open mesh repair	RR 0.41 95% CI 0.26 to 0.44 Data analysed using fixed-effects model; see further information on studies for full details Result was heavily influenced by 1 RCT, [27] and the difference was not significant when this trial was removed		TAPP laparoscopic repair
<b>Adverse effects (general)</b>					
[26] RCT	50 people	<b>Adverse effects</b> with TAPP laparoscopic repair with open mesh repair In the group undergoing TAPP laparoscopic repair, 2 people had			

Ref (type)	Population	Outcome, Interventions	Results and statistical analysis	Effect size	Favours
		pain, swelling, and purulent discharge 12 and 15 months after surgery  In the group undergoing open mesh repair, 1 person had scrotal haematoma and 1 person had superficial wound infection after surgery			
<b>Postoperative pain</b>					
[26] RCT	50 people	<b>Postoperative pain (0 = least pain; 100 = most severe pain) , at 24 hours</b>  20.92 with TAPP laparoscopic repair  37.24 with open mesh repair	P <0.05	○○○	TAPP laparoscopic repair
[21] RCT <b>3-armed trial</b>	280 people with primary hernias  The remaining arm evaluated open suture repair	<b>Absence of postoperative pain</b>  84% with TAPP laparoscopic repair  68% with open mesh repair  Pain measured on a self-report visual analogue scale	P <0.01	○○○	TAPP laparoscopic repair

No data from the following reference on this outcome. [12] [19]

**TAPP laparoscopic repair versus TEP laparoscopic repair:**

See option on TEP laparoscopic repair, p 11 .

**Further information on studies**

[25] A further report of one RCT [23] reported no significant difference between TAPP laparoscopic repair and open suture repair in discomfort levels after five years (9% with TAPP repair v 11% with suture repair; P = 0.12).

[15] **Analysis of data** The review analysed data using the fixed-effects model, as opposed to the random-effects model, and this may have overestimated differences between the two treatments. **Heterogeneity** The review reported a lack of consistency in results for recurrence among the included RCTs. Reasons for heterogeneity may include the use of different variants of the surgical techniques, different participant characteristics, differing experience of operating surgeons, or differing methods of outcome measurement among studies. The review also found heterogeneity among RCTs in length of hospital stay. There were greater differences in mean length of stay between different hospitals than between different operative techniques. This may suggest that the overall findings reflect differences in healthcare systems as opposed to differences owing to types of repair.

[17] **Analysis of data** The review analysed data using the fixed-effects model, as opposed to the random-effects model, and this may have overestimated differences between the two treatments.

[19] The long-term follow-up compared small mesh TAPP laparoscopic repair, large mesh TAPP laparoscopic repair, and totally extraperitoneal (TEP) laparoscopic repair versus open mesh repair. It found that laparoscopic repair significantly reduced the proportion of people with chronic pain at 5 years compared with open mesh repair, although the results for TAPP and TEP laparoscopic repair were not reported separately (pain: 0/62 [0%] with TAPP or TEP laparoscopic repair v 4/59 [7%] with open mesh repair; 95% CI -10 to -0.4; P = 0.04). Pooled results found lower recurrence rates at 5 years with TAPP laparoscopic repair using large mesh compared with open mesh repair, but increased recurrence rates with TAPP laparoscopic repair using a small mesh compared with both other groups (recurrence: 0/20 [0%] with TAPP laparoscopic repair using large mesh v 5/20 [25%] with TAPP laparoscopic repair using a small mesh v 2/59 [3%] with open mesh repair; significance assessment for differences between groups not reported).

**Comment:** **Clinical guide:**  
TAPP laparoscopic repair reduces pain, but has similar recurrence rates compared with open suture and open mesh repair. Complication rates are similar between TAPP laparoscopic repair and open suture repair. However, TAPP repair reduces the risk of haematoma and superficial infection compared with open mesh repair.

**OPTION      OPEN SUTURE REPAIR FOR UNILATERAL INGUINAL HERNIA**

- For GRADE evaluation of interventions for Inguinal hernia, [see table, p 60](#) .
- Open suture repair is a well-established surgical treatment for people with unilateral inguinal hernia, but seems less effective at preventing recurrence, and prolongs recovery, compared with other techniques.

**Benefits and harms**

**Open suture repair versus expectant management:**

We found no systematic review, RCTs, or cohort studies of sufficient quality comparing [open suture repair](#) versus expectant management.

**Open suture repair versus open mesh repair:**

See option on open mesh repair, p 3 .

**Open suture repair versus transabdominal preperitoneal (TAPP) laparoscopic repair:**

See option on TAPP laparoscopic repair, p 22 .

**Open suture repair versus TEP laparoscopic repair:**

See option on TEP laparoscopic repair, p 11 .

**Further information on studies**

**Comment:** **Clinical guide:**  
Clinical experience and consensus suggest that surgery is effective for primary unilateral inguinal hernia. Open suture repair is a well-established method of management for people with inguinal hernias. However, there is strong evidence to show that open suture repair has an increased recurrence rate when compared with open mesh repair. There is no significant difference in other peri-operative complications between the two methods.

**OPTION      EXPECTANT MANAGEMENT FOR UNILATERAL INGUINAL HERNIA**

- For GRADE evaluation of interventions for Inguinal hernia, [see table, p 60](#) .
- We don't know whether expectant management is better than open suture repair or laparoscopic repair in people with unilateral inguinal hernia because we found no studies.

## Benefits and harms

### Expectant management versus open mesh repair:

See option on open mesh repair, p 42 .

### Expectant management versus open suture repair or laparoscopic repair:

We found no systematic review, RCTs, or cohort studies of sufficient quality comparing expectant management versus [open suture repair](#) or laparoscopic repair.

## Further information on studies

### Comment:

#### Clinical guide:

Expectant management might be considered a reasonable strategy in people who have only minimally symptomatic hernias, low risk of hernia complications (see prognosis), or high operative risk. Although the only RCTs we found compared expectant management versus [open mesh repair](#), the results may be applicable to comparisons of other surgical management strategies.

## QUESTION

What are the effects of elective treatments for primary bilateral inguinal hernia in adults?

## OPTION

OPEN MESH REPAIR FOR BILATERAL INGUINAL HERNIA

- For GRADE evaluation of interventions for Inguinal hernia, [see table, p 60](#) .
- Open mesh repair seems to be as effective as [totally extraperitoneal \(TEP\) laparoscopic repair](#), but may prolong recovery and increase complication rates compared with [transabdominal preperitoneal \(TAPP\) laparoscopic repair](#).
- We found no clinically important results from RCTs or cohort studies about open mesh repair compared with no active intervention (expectant management).

## Benefits and harms

### Open mesh repair versus expectant management:

We found two RCTs <sup>[6]</sup> <sup>[7]</sup> comparing [open mesh repair](#) versus expectant management in people with primary, recurrent, and bilateral hernias; the majority had primary unilateral hernias. However, groups were not analysed separately and it is uncertain whether the results are applicable to a subset of people with primary bilateral hernias.

### Open mesh repair versus open suture repair:

We found one systematic review (search date 2000). <sup>[8]</sup>

## Hospitalisation

*Open mesh repair compared with open suture repair* We don't know how [open mesh](#) and [open suture](#) repair compare at decreasing length of hospital stay ([low-quality evidence](#)).

Ref (type)	Population	Outcome, Interventions	Results and statistical analysis	Effect size	Favours
<b>Hospital stay</b>					
<sup>[8]</sup> Systematic review	46 people with bilateral inguinal hernia 2 RCTs in this analysis	<b>Length of hospital stay</b> with <a href="#">open mesh repair</a>	WMD 1.52 days 95% CI 0.70 days to 2.33 days	○○○	open mesh repair

Ref (type)	Population	Outcome, Interventions	Results and statistical analysis	Effect size	Favours
		with <a href="#">open suture repair</a>	See further information on studies for discussion of clinical relevance of results		

## Recurrence

*Open mesh repair compared with open suture repair* We don't know how [open mesh](#) and [open suture](#) repair compare at reducing hernia recurrence ([low-quality evidence](#)).

Ref (type)	Population	Outcome, Interventions	Results and statistical analysis	Effect size	Favours
<b>Recurrence</b>					
<sup>[8]</sup> Systematic review	46 people with bilateral inguinal hernia 2 RCTs in this analysis	<b>Recurrence</b> with <a href="#">open mesh repair</a> with <a href="#">open suture repair</a>	OR 0.70 95% CI 0.05 to 9.60 See further information on studies for discussion of clinical relevance of results	↔	Not significant

## Pain

No data from the following reference on this outcome. <sup>[8]</sup>

## Hernia complications

No data from the following reference on this outcome. <sup>[8]</sup>

## Return to normal activities/work

No data from the following reference on this outcome. <sup>[8]</sup>

## Quality of life

No data from the following reference on this outcome. <sup>[8]</sup>

## Adverse effects

Ref (type)	Population	Outcome, Interventions	Results and statistical analysis	Effect size	Favours
<b>Haematoma</b>					
<sup>[8]</sup> Systematic review	46 people with bilateral inguinal hernia 2 RCTs in this analysis	<b>Haematoma</b> with <a href="#">open mesh repair</a> with <a href="#">open suture repair</a>	OR 0.47 95% CI 0.08 to 2.83 See further information on studies for discussion of clinical relevance of results	↔	Not significant



Ref (type)	Population	Outcome, Interventions	Results and statistical analysis	Effect size	Favours
<b>Seroma</b>					
[8] Systematic review	46 people with bilateral inguinal hernia 2 RCTs in this analysis	<b>Seroma</b> with open mesh repair with open suture repair	OR 7.30 95% CI 0.36 to 146.00 See further information on studies for discussion of clinical relevance of results	↔	Not significant

**Open mesh repair versus totally extraperitoneal (TEP) laparoscopic repair:**

See option on TEP laparoscopic repair, p 34 .

**Open mesh repair versus transabdominal preperitoneal (TAPP) laparoscopic repair:**

See option on TAPP laparoscopic repair, p 37 .

**Further information on studies**

[8] **Methodological limitations** The meta-analyses were based on limited data, so the incidence of several clinically important outcomes could not be estimated. Similarly, many of the RCTs lacked power to detect clinically important differences in outcomes. Confidence intervals were wide, and the lack of significance for these results should not be taken to imply a lack of clinically important difference between surgical techniques. **Time to return to normal activities** The review found no significant difference between both techniques in time to return to normal activities, persisting pain after 3 months (time to normal activities: 1 RCT, 10 people, HR 1.47, 95% CI 0.43 to 5.09; pain: 1 RCT, 10 people, OR 12.18, 95% CI 0.22 to 665.00). However, the number of people in the RCT was below the minimum criteria for reporting in this *Clinical Evidence* review.

**Comment:**

**Clinical guide:**

There have been few studies comparing open mesh repair with open suture repair in patients with primary bilateral inguinal hernia. However, results from primary unilateral inguinal hernia may be applicable to this group of people.

**OPTION OPEN SUTURE REPAIR FOR BILATERAL INGUINAL HERNIA**

- For GRADE evaluation of interventions for Inguinal hernia, see table, p 60 .
- Open suture repair may be associated with longer recovery times compared with open mesh repair or transabdominal preperitoneal (TAPP) laparoscopic repair in people with bilateral inguinal hernia.
- We found no clinically important results from RCTs or cohort studies about open suture repair compared with no active intervention (expectant management).

**Benefits and harms**

**Open suture repair versus expectant management:**

We found no systematic review, RCTs, or cohort studies of sufficient quality comparing open suture repair versus expectant management.

**Open suture repair versus open mesh repair:**

See option on open mesh repair, p 31 .

**Open suture repair versus totally extraperitoneal (TEP) laparoscopic repair:**

See option on TEP laparoscopic repair, p 34 .

**Open suture repair versus transabdominal preperitoneal (TAPP) laparoscopic repair:**

See option on TAPP laparoscopic repair, p 37 .

**Further information on studies**

**Comment:**

**Clinical guide:**

Clinical experience and consensus suggest that surgical intervention is an effective treatment for bilateral inguinal hernia. Open suture repair is a well-established surgical technique.

**OPTION TOTALLY EXTRAPERITONEAL (TEP) LAPAROSCOPIC REPAIR FOR BILATERAL INGUINAL HERNIA**

- For GRADE evaluation of interventions for Inguinal hernia, see table, p 60 .
- TEP laparoscopic repair seems to be as effective as open mesh repair.
- We found no clinically important results from RCTs or cohort studies about TEP laparoscopic repair compared with no active intervention (expectant management), open suture repair, or transabdominal preperitoneal (TAPP) laparoscopic repair in people with bilateral inguinal hernia.

**Benefits and harms**

**Totally extraperitoneal (TEP) laparoscopic repair versus expectant management:**

We found no systematic review, RCTs, or cohort studies of sufficient quality comparing TEP laparoscopic repair versus expectant management.

**TEP laparoscopic repair versus open mesh repair:**

We found one systematic review (search date 2003).<sup>[17]</sup>

**Pain**

*TEP laparoscopic repair compared with open mesh repair* We don't know how TEP laparoscopic repair and open mesh repair compare at reducing persisting pain (low-quality evidence).

Ref (type)	Population	Outcome, Interventions	Results and statistical analysis	Effect size	Favours
<b>Pain</b>					
[17] Systematic review	74 people 2 RCTs in this analysis	<b>Persisting pain</b> with TEP laparoscopic repair with open mesh repair	RR 0.97 95% CI 0.62 to 1.52 See further information on studies for discussion of clinical relevance of results	↔	Not significant

**Return to normal activities/work**

*TEP laparoscopic repair compared with open mesh repair* We don't know how [TEP laparoscopic repair](#) and [open mesh repair](#) compare at decreasing the time taken to return to normal activities ([low-quality evidence](#)).

Ref (type)	Population	Outcome, Interventions	Results and statistical analysis	Effect size	Favours
<b>Return to normal activities</b>					
[17] Systematic review	73 people 3 RCTs in this analysis	<b>Time to usual activities</b> with <a href="#">TEP laparoscopic repair</a> with <a href="#">open mesh repair</a>	HR 0.79 95% CI 0.47 to 1.32 See further information on studies for discussion of clinical relevance of results	↔	Not significant

**Recurrence**

*TEP laparoscopic repair compared with open mesh repair* We don't know how [TEP laparoscopic repair](#) and [open mesh repair](#) compare at reducing recurrence ([low-quality evidence](#)).

Ref (type)	Population	Outcome, Interventions	Results and statistical analysis	Effect size	Favours
<b>Recurrence</b>					
[17] Systematic review	110 people 3 RCTs in this analysis	<b>Recurrence</b> with <a href="#">TEP laparoscopic repair</a> with <a href="#">open mesh repair</a>	RR 4.44 95% CI 0.52 to 38.01 See further information on studies for discussion of clinical relevance of results	↔	Not significant

**Hernia complications**

No data from the following reference on this outcome. <sup>[17]</sup>

**Hospitalisation**

No data from the following reference on this outcome. <sup>[17]</sup>

**Quality of life**

No data from the following reference on this outcome. <sup>[17]</sup>

**Adverse effects**

Ref (type)	Population	Outcome, Interventions	Results and statistical analysis	Effect size	Favours
<b>Haematoma</b>					
[17] Systematic review	72 people 2 RCTs in this analysis	<b>Haematoma</b> with <a href="#">TEP laparoscopic repair</a> with <a href="#">open mesh repair</a>	RR 2.17 95% CI 0.57 to 8.24 See further information on studies for discussion of clinical relevance of results	↔	Not significant

Ref (type)	Population	Outcome, Interventions	Results and statistical analysis	Effect size	Favours
<b>Seroma</b>					
[17] Systematic review	71 people 2 RCTs in this analysis	<b>Seroma</b> with <a href="#">TEP laparoscopic repair</a> with <a href="#">open mesh repair</a>	RR 0.58 95% CI 0.12 to 2.91 See further information on studies for discussion of clinical relevance of results	↔	Not significant
<b>Infection</b>					
[17] Systematic review	71 people 2 RCTs in this analysis	<b>Superficial infection</b> with <a href="#">TEP laparoscopic repair</a> with <a href="#">open mesh repair</a>	RR 0.39 95% CI 0.02 to 9.07 See further information on studies for discussion of clinical relevance of results	↔	Not significant
<b>Numbness</b>					
[17] Systematic review	71 people 2 RCTs in this analysis	<b>Numbness</b> with <a href="#">TEP laparoscopic repair</a> with <a href="#">open mesh repair</a>	RR 1.05 95% CI 0.49 to 2.22 See further information on studies for discussion of clinical relevance of results	↔	Not significant

**TEP laparoscopic repair versus open suture repair:**

We found one systematic review (search date 2002, 4 RCTs, 97 patients) comparing [TEP laparoscopic repair](#) with [open suture repair](#).<sup>[15]</sup> The RCTs within the review examined different outcome measures with heterogeneous results. The systematic review concluded that there was insufficient evidence to compare the effects of TEP laparoscopic repair versus open suture repair on time to return to usual activities, recurrence, persisting pain after 3 months, or harms.

**TEP laparoscopic repair versus TAPP laparoscopic repair:**

We found no systematic reviews or RCTs that compared [TEP laparoscopic repair](#) with [TAPP laparoscopic repair](#) in bilateral inguinal hernias.

**Further information on studies**

[17] The meta-analyses were based on few data. Therefore, the incidence of several clinically important outcomes could not be estimated. Similarly, many of the RCTs lacked power to detect clinically important differences in outcomes. Confidence intervals were wide, and the lack of significance for these results should not be taken to imply a lack of clinically important difference between surgical techniques.

**Comment:**

**Clinical guide:**

There is limited evidence showing no significant difference in persisting pain or recurrence between TEP laparoscopic repair and open mesh repair. There are insufficient data to compare TEP laparoscopic repair and open suture repair.

**OPTION TRANSABDOMINAL PREPERITONEAL (TAPP) LAPAROSCOPIC REPAIR FOR BILATERAL INGUINAL HERNIA**

- For GRADE evaluation of interventions for Inguinal hernia, see table, p 60 .
- TAPP laparoscopic repair may be associated with shorter recovery times compared with open suture repair in people with bilateral inguinal hernia.
- TAPP laparoscopic repair may shorten recovery and decrease complication rates compared with open mesh repair.

**Benefits and harms**

**TAPP laparoscopic repair versus expectant management:**

We found no systematic review, RCTs, or cohort studies of sufficient quality comparing TAPP laparoscopic repair versus expectant management.

**TAPP laparoscopic repair versus open mesh repair:**

We found one systematic review (search date 2003) comparing TAPP laparoscopic repair with open mesh repair.<sup>[17]</sup>

**Pain**

*TAPP laparoscopic repair compared with open mesh repair* We don't know how TAPP laparoscopic repair and open mesh repair compare at reducing persistent pain (low-quality evidence).

Ref (type)	Population	Outcome, Interventions	Results and statistical analysis	Effect size	Favours
<b>Pain</b>					
<sup>[17]</sup> Systematic review	86 people 3 RCTs in this analysis	<b>Persisting pain</b> with TAPP laparoscopic repair with open mesh repair	RR 0.80 95% CI 0.45 to 1.45 See further information on studies for discussion of clinical relevance of results	↔	Not significant

**Hospitalisation**

*TAPP laparoscopic repair compared with open mesh repair* We don't know how TAPP laparoscopic repair and open mesh repair compare at reducing length of hospital stay (low-quality evidence).

Ref (type)	Population	Outcome, Interventions	Results and statistical analysis	Effect size	Favours
<b>Hospital stay</b>					
<sup>[17]</sup> Systematic review	107 people 6 RCTs in this analysis	<b>Length of hospital stay</b> with TAPP laparoscopic repair with open mesh repair	WMD -0.18 days 95% CI -0.38 days to +0.02 days See further information on studies for discussion of clinical relevance of results	↔	Not significant

**Return to normal activities/work**

*TAPP laparoscopic repair compared with open mesh repair* TAPP laparoscopic repair may be more effective than open mesh repair at reducing the time taken to return to normal activities (low-quality evidence).

Ref (type)	Population	Outcome, Interventions	Results and statistical analysis	Effect size	Favours
<b>Return to normal activities</b>					
[17] Systematic review	87 people 6 RCTs in this analysis	<b>Time to normal activities</b> with <b>TAPP laparoscopic repair</b> with <b>open mesh repair</b>	HR 0.51 95% CI 0.32 to 0.81 See further information on studies for discussion of clinical relevance of results		TAPP laparoscopic repair

## Recurrence

*TAPP laparoscopic repair compared with open mesh repair* We don't know how **TAPP laparoscopic repair** and **open mesh repair** compare at reducing hernia recurrence (*low-quality evidence*).

Ref (type)	Population	Outcome, Interventions	Results and statistical analysis	Effect size	Favours
<b>Recurrence</b>					
[17] Systematic review	152 people 7 RCTs in this analysis	<b>Recurrence</b> with <b>TAPP laparoscopic repair</b> with <b>open mesh repair</b>	RR 2.02 95% CI 0.52 to 7.83 See further information on studies for discussion of clinical relevance of results		Not significant

## Hernia complications

No data from the following reference on this outcome. [17]

## Quality of life

No data from the following reference on this outcome. [17]

## Adverse effects

*TAPP laparoscopic repair compared with open mesh repair* **TAPP laparoscopic repair** may be associated with a lower risk of persisting numbness and superficial infection compared with **open mesh repair**, but may be associated with a similar risk of haematoma or seroma (*low-quality evidence*).

Ref (type)	Population	Outcome, Interventions	Results and statistical analysis	Effect size	Favours
<b>Haematoma</b>					
[17] Systematic review	140 people 6 RCTs in this analysis	<b>Haematoma</b> with <b>TAPP laparoscopic repair</b> with <b>open mesh repair</b>	RR 0.76 95% CI 0.35 to 1.65 See further information on studies for discussion of clinical relevance of results		Not significant
<b>Seroma</b>					
[17] Systematic review	140 people 6 RCTs in this analysis	<b>Seroma</b> with <b>TAPP laparoscopic repair</b> with <b>open mesh repair</b>	RR 2.62 95% CI 0.92 to 7.48 See further information on studies for discussion of clinical relevance of results		Not significant

Ref (type)	Population	Outcome, Interventions	Results and statistical analysis	Effect size	Favours
<b>Numbness</b>					
[17] Systematic review	96 people 4 RCTs in this analysis	<b>Persisting numbness</b> with <a href="#">TAPP laparoscopic repair</a> with <a href="#">open mesh repair</a>	RR 0.23 95% CI 0.06 to 0.94 See further information on studies for discussion of clinical relevance of results		TAPP laparoscopic repair
<b>Infection</b>					
[17] Systematic review	140 people 6 RCTs in this analysis	<b>Superficial infection</b> with <a href="#">TAPP laparoscopic repair</a> with <a href="#">open mesh repair</a>	RR 0.26 95% CI 0.09 to 0.72 See further information on studies for discussion of clinical relevance of results		TAPP laparoscopic repair

**TAPP laparoscopic repair versus open suture repair:**

We found one systematic review (search date 2002). [15]

**Pain**

*TAPP laparoscopic repair compared with open suture repair* We don't know how [TAPP laparoscopic repair](#) and [open suture repair](#) compare at reducing persisting pain at 3 months (*low-quality evidence*).

Ref (type)	Population	Outcome, Interventions	Results and statistical analysis	Effect size	Favours
<b>Pain</b>					
[15] Systematic review	63 people 2 RCTs in this analysis	<b>Persisting pain , at 3 months</b> with <a href="#">TAPP laparoscopic repair</a> with <a href="#">open suture repair</a>	OR 0.38 95% CI 0.10 to 1.43 See further information on studies for discussion of clinical relevance of results		Not significant

**Hospitalisation**

*TAPP laparoscopic repair compared with open suture repair* We don't know how [TAPP laparoscopic repair](#) and [open suture repair](#) compare at reducing length of hospital stay (*low-quality evidence*).

Ref (type)	Population	Outcome, Interventions	Results and statistical analysis	Effect size	Favours
<b>Hospital stay</b>					
[15] Systematic review	97 people 4 RCTs in this analysis	<b>Length of hospital stay</b> with <a href="#">TAPP laparoscopic repair</a> with <a href="#">open suture repair</a>	WMD -0.05 days 95% CI -0.17 days to +0.07 days See further information on studies for discussion of clinical relevance of results		Not significant

**Return to normal activities/work**

*TAPP laparoscopic repair compared with open suture repair* [TAPP laparoscopic repair](#) may be more effective than [open suture repair](#) at reducing time taken to return to normal activities (*low-quality evidence*).

Ref (type)	Population	Outcome, Interventions	Results and statistical analysis	Effect size	Favours
<b>Return to normal activities</b>					
[15] Systematic review	59 people 3 RCTs in this analysis	<b>Time to return to normal activities</b> with <a href="#">TAPP laparoscopic repair</a> with <a href="#">open suture repair</a>	OR 0.52 95% CI 0.31 to 0.88 See further information on studies for discussion of clinical relevance of results		TAPP laparoscopic repair

**Hernia complications**

No data from the following reference on this outcome. [15]

**Recurrence**

No data from the following reference on this outcome. [15]

**Quality of life**

No data from the following reference on this outcome. [15]

**Adverse effects**

*TAPP laparoscopic repair compared with open suture repair* [TAPP laparoscopic repair](#) and [open suture repair](#) may be associated with similar rates of adverse effects (haematoma, seroma, superficial infection, and visceral injury) (*low-quality evidence*).

Ref (type)	Population	Outcome, Interventions	Results and statistical analysis	Effect size	Favours
<b>Haematoma</b>					
[15] Systematic review	97 people 4 RCTs in this analysis	<b>Haematoma</b> with <a href="#">TAPP laparoscopic repair</a> with <a href="#">open suture repair</a>	OR 1.26 95% CI 0.37 to 4.29 See further information on studies for discussion of clinical relevance of results		Not significant
<b>Seroma</b>					
[15] Systematic review	82 people 3 RCTs in this analysis	<b>Seroma</b> with <a href="#">TAPP laparoscopic repair</a> with <a href="#">open suture repair</a>	OR 0.85 95% CI 0.24 to 3.04 See further information on studies for discussion of clinical relevance of results		Not significant
<b>Infection</b>					
[15] Systematic review	97 people 4 RCTs in this analysis	<b>Superficial infection</b> with <a href="#">TAPP laparoscopic repair</a> with <a href="#">open suture repair</a>	OR 0.97 95% CI 0.08 to 11.59 See further information on studies for discussion of clinical relevance of results		Not significant



Ref (type)	Population	Outcome, Interventions	Results and statistical analysis	Effect size	Favours
<b>Injury</b>					
[15] Systematic review	82 people 3 RCTs in this analysis	<b>Visceral injury</b> with <a href="#">TAPP laparoscopic repair</a> with <a href="#">open suture repair</a>	OR 5.16 95% CI 0.09 to 286.00 See further information on studies for discussion of clinical relevance of results	↔	Not significant

### TAPP laparoscopic repair versus TEP laparoscopic repair:

See option on TEP laparoscopic repair, p 34 .

### Further information on studies

[17] [45] The meta-analyses were based on few data. Therefore, the incidence of several clinically important outcomes could not be estimated. Similarly, many of the results lacked power to detect clinically important differences in outcomes. Confidence intervals were wide, and the lack of significance for these results should not be taken to imply a lack of clinically important difference between techniques.

### Comment:

#### Clinical guide:

There is limited evidence to suggest that TAPP laparoscopic repair reduces the time taken to return to normal activities compared with open mesh repair or open suture repair. The limited evidence found no significant difference in recurrence rates between TAPP laparoscopic repair and open mesh repair. However, no evidence was found comparing the recurrence rates between TAPP laparoscopic repair and open suture repair.

## OPTION

### EXPECTANT MANAGEMENT FOR BILATERAL INGUINAL HERNIA

- For GRADE evaluation of interventions for Inguinal hernia, [see table, p 60](#) .
- We found no direct information from RCTs or cohort studies about expectant management in the treatment of people with bilateral inguinal hernia.

### Benefits and harms

#### Expectant management versus open suture repair, open mesh repair, or laparoscopic repair:

We found no systematic review, RCTs, or cohort studies of sufficient quality comparing expectant management versus [open suture repair](#), [open mesh repair](#), or laparoscopic repair.

### Further information on studies

### Comment:

#### Clinical guide:

Expectant management might be considered a reasonable strategy in people who have only mild symptoms, low risk of hernia complications (see prognosis), or high operative risk. However, we found no reliable evidence about the benefits and risks of expectant management compared with surgery.

**QUESTION** What are the effects of elective treatments for recurrent inguinal hernia in adults?

**OPTION** OPEN MESH REPAIR FOR RECURRENT INGUINAL HERNIA

- For GRADE evaluation of interventions for Inguinal hernia, see table, p 60 .
- Open mesh repair may be associated with a decreased recovery time compared with open suture repair in people with recurrent inguinal hernia.

**Benefits and harms**

**Open mesh repair versus expectant management:**

We found no systematic reviews, RCTs, or cohort studies of sufficient quality comparing open mesh repair versus expectant management in recurrent inguinal hernia alone. We found two RCTs comparing open mesh repair with expectant management in people with primary, recurrent, and bilateral hernias; the majority had primary unilateral hernias.<sup>[6] [7]</sup> However, groups were not analysed separately, and it is uncertain whether the results of these RCTs are applicable to a subset of people with recurrent hernias. Both RCTs had one person in the expectant management group who required surgical repair due to an acute exacerbation of a hernia. However, it is not known if these were people with unilateral, bilateral, or recurrent hernias.

**Open mesh repair versus open suture repair:**

We found one systematic review (search date 2000).<sup>[8]</sup>

**Pain**

*Open mesh repair compared with open suture repair* We don't know how open mesh repair and open suture repair compare at reducing persistent pain at 3 months (low-quality evidence).

Ref (type)	Population	Outcome, Interventions	Results and statistical analysis	Effect size	Favours
<b>Pain</b>					
<sup>[8]</sup> Systematic review	49 people 2 RCTs in this analysis	<b>Persisting pain , after 3 months</b> with open mesh repair with open suture repair	OR 1.05 95% CI 0.19 to 5.82 See further information on studies for discussion of clinical relevance of results	↔	Not significant

**Hospitalisation**

*Open mesh repair compared with open suture repair* Open mesh repair may be more effective than open suture repair at marginally reducing the length of hospital stay (low-quality evidence).

Ref (type)	Population	Outcome, Interventions	Results and statistical analysis	Effect size	Favours
<b>Hospital stay</b>					
<sup>[8]</sup> Systematic review	59 people 2 RCTs in this analysis	<b>Length of hospital stay</b> with open mesh repair with open suture repair	WMR 0.41 days 95% CI 0.07 to 0.75 The effect was described as small See further information on studies for discussion of clinical relevance of results	○○○	open mesh repair

**Return to normal activities/work**

*Open mesh repair compared with open suture repair* We don't know how open mesh repair and open suture repair compare at reducing time taken to return to normal activities (low-quality evidence).

Ref (type)	Population	Outcome, Interventions	Results and statistical analysis	Effect size	Favours
<b>Return to normal activities</b>					
[8] Systematic review	33 people 2 RCTs in this analysis	<b>Time to return to usual activities</b> with <a href="#">open mesh repair</a> with <a href="#">open suture repair</a>	HR 0.88 95% CI 0.44 to 1.74 See further information on studies for discussion of clinical relevance of results	↔	Not significant

**Recurrence**

*Open mesh repair compared with open suture repair* We don't know how [open mesh repair](#) and [open suture repair](#) compare at reducing further hernia recurrence ([low-quality evidence](#)).

Ref (type)	Population	Outcome, Interventions	Results and statistical analysis	Effect size	Favours
<b>Further recurrence</b>					
[8] Systematic review	59 people 2 RCTs in this analysis	<b>Further recurrence</b> with <a href="#">open mesh repair</a> with <a href="#">open suture repair</a>	OR 1.79 95% CI 0.39 to 8.23 See further information on studies for discussion of clinical relevance of results	↔	Not significant

**Hernia complications**

No data from the following reference on this outcome. [8]

**Quality of life**

No data from the following reference on this outcome. [8]

**Adverse effects**

Ref (type)	Population	Outcome, Interventions	Results and statistical analysis	Effect size	Favours
<b>Mortality</b>					
[8] Systematic review	People with inguinal hernia	<b>Mortality</b> with <a href="#">open mesh repair</a> with <a href="#">open suture repair</a>	OR 0.07 95% CI 0 to 1.28 See further information on studies for discussion of clinical relevance of results	↔	Not significant
<b>Haematoma</b>					
[8] Systematic review	People with inguinal hernia	<b>Haematoma</b> with <a href="#">open mesh repair</a> with <a href="#">open suture repair</a>	OR 0.98 95% CI 0 to 16.53 See further information on studies for discussion of clinical relevance of results	↔	Not significant

Ref (type)	Population	Outcome, Interventions	Results and statistical analysis	Effect size	Favours
<b>Infection</b>					
[8] Systematic review	People with inguinal hernia	<b>Superficial infection</b> with open mesh repair with open suture repair	OR 5.29 95% CI 0.10 to 289.31 See further information on studies for discussion of clinical relevance of results	↔	Not significant
[8] Systematic review	People with inguinal hernia	<b>Life-threatening visceral or vascular injury/deep infection</b> with open mesh repair with open suture repair	OR 1.47 95% CI 0.08 to 25.46 See further information on studies for discussion of clinical relevance of results	↔	Not significant
<b>Numbness</b>					
[8] Systematic review	People with inguinal hernia	<b>Numbness</b> with open mesh repair with open suture repair	OR 1.73 95% CI 0.29 to 10.16 See further information on studies for discussion of clinical relevance of results	↔	Not significant

**Open mesh repair versus totally extraperitoneal (TEP) laparoscopic repair:**

See option on TEP laparoscopic repair, p 45 .

**Open mesh repair versus transabdominal preperitoneal (TAPP) laparoscopic repair:**

See option on TAPP laparoscopic repair, p 49 .

**Further information on studies**

[8] Many of the results lacked power to detect clinically important differences in outcomes. Confidence intervals were wide, and the lack of significance for these results should not be taken to imply a lack of clinically important difference between surgical techniques.

**Comment:**

**Clinical guide:**

There is little evidence comparing open mesh repair with open suture repair in people with recurrent inguinal hernia. The limited evidence suggests no significant difference in recurrence between the two groups. In the authors' experience, open mesh repair tends to be used more frequently than open suture repair for recurrent inguinal hernia. This is likely to be secondary to the experience with primary inguinal hernia, where open mesh repair has been demonstrated to have lower recurrence rates than open suture repair.

**OPTION OPEN SUTURE REPAIR FOR RECURRENT INGUINAL HERNIA**

- For GRADE evaluation of interventions for Inguinal hernia, see table, p 60 .
- Open suture repair may be associated with an increased recovery time compared with open mesh repair in people with recurrent inguinal hernia.
- We don't know how open suture repair compares with totally extraperitoneal (TEP) or transabdominal preperitoneal (TAPP) laparoscopic repair in people with recurrent inguinal hernia.

- We found no clinically important results from RCTs or cohort studies about open suture repair compared with no active intervention (expectant management), or about open suture repair compared with TEP laparoscopic repair, in people with recurrent inguinal hernia.

## Benefits and harms

### Open suture repair versus expectant management:

We found no systematic review, RCTs, or cohort studies of sufficient quality comparing [open suture repair](#) versus expectant management.

### Open suture repair versus open mesh repair:

See option on open mesh repair, p 42 .

### Open suture repair versus totally extraperitoneal (TEP) laparoscopic repair:

See option on TEP laparoscopic repair, p 45 .

### Open suture repair versus transabdominal preperitoneal (TAPP) repair:

See option on TAPP laparoscopic repair, p 49 .

## Further information on studies

### Comment:

### Clinical guide:

Open suture repair is a well-established method of management for people with inguinal hernias, based on clinical experience and consensus.

## OPTION

## TOTALLY EXTRAPERITONEAL (TEP) LAPAROSCOPIC REPAIR FOR RECURRENT INGUINAL HERNIA

- For GRADE evaluation of interventions for Inguinal hernia, [see table, p 60](#) .
- We don't know how [TEP laparoscopic repair](#) compares with [open suture repair](#) in people with recurrent inguinal hernia.
- TEP laparoscopic repair may reduce recovery time compared with [open mesh repair](#), but complication rates seem to be similar.
- We found no clinically important results from RCTs or cohort studies about TEP laparoscopic repair compared with no active intervention (expectant management), open suture repair, or [transabdominal preperitoneal \(TAPP\) laparoscopic repair](#) in people with recurrent inguinal hernia.

## Benefits and harms

### TEP laparoscopic repair versus expectant management:

We found no systematic review, RCTs, or cohort studies of sufficient quality comparing [TEP laparoscopic repair](#) versus expectant management.

**TEP laparoscopic repair versus open mesh repair:**

We found one systematic review (search date 2003) <sup>[17]</sup> and one subsequent RCT. <sup>[28]</sup>

**Pain**

*TEP laparoscopic repair compared with open mesh repair* We don't know how TEP laparoscopic repair and open mesh repair compare at reducing persistent pain (*very low-quality evidence*).

Ref (type)	Population	Outcome, Interventions	Results and statistical analysis	Effect size	Favours
<b>Pain</b>					
<sup>[17]</sup> Systematic review	122 people 2 RCTs in this analysis	<b>Persisting pain</b> with TEP laparoscopic repair with open mesh repair	RR 0.90 95% CI 0.59 to 1.38 See further information on studies for discussion of clinical relevance of results	↔	Not significant

No data from the following reference on this outcome. <sup>[28]</sup>

**Hospitalisation**

*TEP laparoscopic repair compared with open mesh repair* We don't know how TEP laparoscopic repair and open mesh repair compare at reducing the length of hospital stay (*low-quality evidence*).

Ref (type)	Population	Outcome, Interventions	Results and statistical analysis	Effect size	Favours
<b>Hospital stay</b>					
<sup>[17]</sup> Systematic review	88 people 2 RCTs in this analysis	<b>Length of hospital stay</b> with TEP laparoscopic repair with open mesh repair	WMD +0.24 95% CI -0.45 to +0.93 See further information on studies for discussion of clinical relevance of results	↔	Not significant
<sup>[28]</sup> RCT <b>3-armed trial</b>	82 men with recurrent inguinal hernia The remaining arm evaluated transabdominal preperitoneal laparoscopic repair	<b>Length of hospital stay</b> 18.5 hours with TEP laparoscopic repair 20.4 hours with open mesh repair	P = 0.172	↔	Not significant

**Return to normal activities/work**

*TEP laparoscopic repair compared with open mesh repair* TEP laparoscopic repair may be more effective than open mesh repair at reducing the time taken to return to normal activities (*low-quality evidence*).

Ref (type)	Population	Outcome, Interventions	Results and statistical analysis	Effect size	Favours
<b>Return to normal activities</b>					
<sup>[17]</sup> Systematic review	97 people 3 RCTs in this analysis	<b>Time to return to usual activities</b> with TEP laparoscopic repair with open mesh repair	HR 0.55 95% CI 0.35 to 0.89 See further information on studies for discussion of clinical relevance of results	● ○ ○	TEP laparoscopic repair
<sup>[28]</sup> RCT <b>3-armed trial</b>	82 men with recurrent inguinal hernia The remaining arm evaluated transabdominal preperitoneal laparoscopic repair	<b>Time to return to usual activities</b> 13 days with TEP laparoscopic repair 20 days with open mesh repair	P = 0.001	○ ○ ○ ○	TEP laparoscopic repair

Ref (type)	Population	Outcome, Interventions	Results and statistical analysis	Effect size	Favours
	toneal laparoscopic repair				

**Recurrence**

*TEP laparoscopic repair compared with open mesh repair* We don't know how [TEP laparoscopic repair](#) and [open mesh repair](#) compare at reducing further hernia recurrence (*low-quality evidence*).

Ref (type)	Population	Outcome, Interventions	Results and statistical analysis	Effect size	Favours
<b>Further recurrence</b>					
[17] Systematic review	127 people 2 RCTs in this analysis	<b>Further recurrence</b> with <a href="#">TEP laparoscopic repair</a> with <a href="#">open mesh repair</a>	RR 1.08 95% CI 0.57 to 2.05 See further information on studies for discussion of clinical relevance of results	↔	Not significant
[28] RCT <b>3-armed trial</b>	82 men with recurrent inguinal hernia The remaining arm evaluated <a href="#">transabdominal preperitoneal laparoscopic repair</a>	<b>Recurrence , within 3 years</b> 2/26 (8%) with TEP laparoscopic repair 5/32 (16%) with open mesh repair	Significance not assessed		

**Hernia complications**

No data from the following reference on this outcome. [17] [28]

**Quality of life**

No data from the following reference on this outcome. [17] [28]

**Adverse effects**

*TEP laparoscopic repair compared with open mesh repair* [TEP laparoscopic repair](#) may be more effective than [open mesh repair](#) at reducing postoperative pain or the occurrence of haematoma, and may be associated with a similar risk of seroma or persisting numbness (*low-quality evidence*).

Ref (type)	Population	Outcome, Interventions	Results and statistical analysis	Effect size	Favours
<b>Haematoma</b>					
[17] Systematic review	117 people 2 RCTs in this analysis	<b>Haematoma</b> with <a href="#">TEP laparoscopic repair</a> with <a href="#">open mesh repair</a>	RR 0.29 95% CI 0.13 to 0.66 See further information on studies for discussion of clinical relevance of results	●●○	TEP laparoscopic repair
<b>Seroma</b>					
[17] Systematic review	117 people 2 RCTs in this analysis	<b>Seroma</b> with <a href="#">TEP laparoscopic repair</a>	RR 0.60 95% CI 0.14 to 2.51	↔	Not significant

Ref (type)	Population	Outcome, Interventions	Results and statistical analysis	Effect size	Favours
		with open mesh repair	See further information on studies for discussion of clinical relevance of results		
<b>Numbness</b>					
[17] Systematic review	117 people 2 RCTs in this analysis	<b>Persisting numbness</b> with TEP laparoscopic repair with open mesh repair	RR 1.22 95% CI 0.63 to 2.35 See further information on studies for discussion of clinical relevance of results	↔	Not significant
<b>Perioperative complications</b>					
[28] RCT 3-armed trial	82 men with recurrent inguinal hernia The remaining arm evaluated transabdominal preperitoneal laparoscopic repair	<b>Perioperative complications (bleeding, haematoma, and infection)</b> 3/26 (12%) with TEP laparoscopic repair 12/32 (38%) with open mesh repair	P = 0.026	○○○	TEP laparoscopic repair
<b>Postoperative pain</b>					
[28] RCT 3-armed trial	82 men with recurrent inguinal hernia The remaining arm evaluated transabdominal preperitoneal laparoscopic repair	<b>Postoperative pain (median pain score measured on a visual analogue scale: 1, no pain to 10, worst possible pain) , 24 hours</b> 1 with TEP laparoscopic repair 4 with open mesh repair	P = 0.001	○○○	TEP laparoscopic repair
[28] RCT 3-armed trial	82 men with recurrent inguinal hernia The remaining arm evaluated transabdominal preperitoneal laparoscopic repair	<b>Pain (median pain score measured on a visual analogue scale: 1, no pain to 10, worst possible pain) , 20 days</b> 0 with TEP laparoscopic repair 2 with open mesh repair	P = 0.001	○○○	TEP laparoscopic repair
[28] RCT 3-armed trial	82 men with recurrent inguinal hernia The remaining arm evaluated transabdominal preperitoneal laparoscopic repair	<b>Duration of analgesic requirement</b> 1.8 days with TEP laparoscopic repair 3.2 days with open mesh repair	P = 0.001	○○○	TEP laparoscopic repair

**TEP laparoscopic repair versus open suture repair:**

We found no RCTs comparing TEP laparoscopic repair with suture repair in recurrent inguinal hernias.

**TEP laparoscopic repair versus TAPP laparoscopic repair:**

We found no systematic reviews or RCTs that compared TEP laparoscopic repair with TAPP laparoscopic repair in recurrent inguinal hernias.



**Further information on studies**

<sup>[17]</sup> The meta-analyses comparing TEP laparoscopic repair versus open surgery for people with recurrent hernia were based on few data. Therefore, the incidence of several clinically important outcomes, particularly complications, could not be estimated. Similarly, many of the results lacked power to detect clinically important differences in outcomes. Confidence intervals were wide, and the lack of significance for these results should not be taken to imply a lack of clinically important difference between surgical techniques.

**Comment:**

**Clinical guide:**

There is limited evidence to show that TEP laparoscopic repair reduces the time taken to return to normal activities, and postoperative haematoma, compared with open mesh repair. We found no significant difference in recurrence rates between the two methods.

**OPTION TRANSABDOMINAL PREPERITONEAL (TAPP) LAPAROSCOPIC REPAIR FOR RECURRENT INGUINAL HERNIA**

- For GRADE evaluation of interventions for Inguinal hernia, see table, p 60 .
- We don't know how TAPP laparoscopic repair compares with open suture repair in people with recurrent inguinal hernia.
- We found no clinically important results from RCTs or cohort studies about TAPP laparoscopic repair compared with no active intervention (expectant management), or TAPP laparoscopic repair in people with recurrent inguinal hernia.

**Benefits and harms**

**TAPP laparoscopic repair versus expectant management:**

We found no systematic review, RCTs, or cohort studies of sufficient quality comparing TAPP laparoscopic repair versus expectant management.

**TAPP laparoscopic repair versus open mesh repair:**

We found one systematic review (search date 2003) <sup>[17]</sup> and two subsequent RCTs. <sup>[28]</sup> <sup>[29]</sup>

**Pain**

*TAPP laparoscopic repair compared with open mesh repair* We don't know how TAPP laparoscopic repair and open mesh repair compare at reducing persistent pain (low-quality evidence).

Ref (type)	Population	Outcome, Interventions	Results and statistical analysis	Effect size	Favours
<b>Pain</b>					
<sup>[17]</sup> Systematic review	164 people 4 RCTs in this analysis	<b>Persisting pain</b> with TAPP laparoscopic repair with open mesh repair	RR 1.00 95% CI 0.54 to 1.85 See further information on studies for discussion of clinical relevance of results	↔	Not significant
<sup>[29]</sup> RCT	147 patients with recurrent inguinal hernia	<b>Frequency of chronic pain , over 5 years</b> with TAPP laparoscopic repair with open mesh repair Absolute results not reported	Reported as not significant P value not reported	↔	Not significant

No data from the following reference on this outcome. <sup>[28]</sup>

**Hospitalisation**

*TAPP laparoscopic repair compared with open mesh repair* [TAPP laparoscopic repair](#) seems as effective as [open mesh repair](#) at reducing the hospital stay (*moderate-quality evidence*).

Ref (type)	Population	Outcome, Interventions	Results and statistical analysis	Effect size	Favours
<b>Hospital stay</b>					
[17] Systematic review	198 people 6 RCTs in this analysis	<b>Length of hospital stay</b> with <a href="#">TAPP laparoscopic repair</a> with <a href="#">open mesh repair</a>	WMD +0.02 days 95% CI -0.13 days to +0.17 days See further information on studies for discussion of clinical relevance of results	↔	Not significant
[28] RCT <b>3-armed trial</b>	82 men with recurrent inguinal hernia The remaining arm evaluated <a href="#">totally extraperitoneal (TEP) repair</a>	<b>Length of hospital stay</b> 18.6 hours with TAPP laparoscopic repair 20.4 hours with open mesh repair	P = 0.206	↔	Not significant

No data from the following reference on this outcome. [29]

**Return to normal activities/work**

*TAPP laparoscopic repair compared with open mesh repair* [TAPP laparoscopic repair](#) seems more effective than [open mesh repair](#) at reducing the time to return to usual activities and the need for sick leave (*moderate-quality evidence*).

Ref (type)	Population	Outcome, Interventions	Results and statistical analysis	Effect size	Favours
<b>Return to normal activities</b>					
[17] Systematic review	121 people 6 RCTs in this analysis	<b>Time to return to usual activities</b> with <a href="#">TAPP laparoscopic repair</a> with <a href="#">open mesh repair</a>	HR 0.60 95% CI 0.41 to 0.87 See further information on studies for discussion of clinical relevance of results	● ○ ○	TAPP laparoscopic repair
[28] RCT <b>3-armed trial</b>	82 men with recurrent inguinal hernia The remaining arm evaluated <a href="#">totally extraperitoneal (TEP) repair</a>	<b>Time to return to normal activities</b> 14 days with TAPP laparoscopic repair 20 days with open mesh repair	P = 0.001	○ ○ ○	TAPP laparoscopic repair
<b>Need for sick leave</b>					
[29] RCT	147 patients with recurrent inguinal hernia	<b>Need for sick leave , at the end of 3 weeks</b> 5% with <a href="#">TAPP laparoscopic repair</a> 35% with <a href="#">open mesh repair</a>	P <0.001	○ ○ ○	TAPP laparoscopic repair

**Recurrence**

*TAPP laparoscopic repair compared with open mesh repair* [TAPP laparoscopic repair](#) seems as effective as [open mesh repair](#) at reducing further hernia recurrence (*moderate-quality evidence*).

Ref (type)	Population	Outcome, Interventions	Results and statistical analysis	Effect size	Favours
<b>Further recurrence</b>					
[17] Systematic review	199 people 6 RCTs in this analysis	<b>Further recurrence</b> with <b>TAPP laparoscopic repair</b> with <b>open mesh repair</b>	RR 1.32 95% CI 0.53 to 3.31 See further information on studies for discussion of clinical relevance of results	↔	Not significant
[28] RCT <b>3-armed trial</b>	82 men with recurrent inguinal hernia  The remaining arm evaluated <b>totally extraperitoneal (TEP) repair</b>	<b>Rates of recurrence , within 3 years</b>  2/24 (8%) with TAPP laparoscopic repair 5/32 (16%) with open mesh repair	Significance not assessed		
[29] RCT	147 patients with recurrent inguinal hernia	<b>Cumulative recurrence rates , at 5 years</b>  12/73 (19%) with TAPP laparoscopic repair 12/74 (18%) with open mesh repair	Reported as not significant P value not reported	↔	Not significant

**Hernia complications**

No data from the following reference on this outcome. [17] [28] [29]

**Quality of life**

No data from the following reference on this outcome. [17] [28] [29]

**Adverse effects**

Ref (type)	Population	Outcome, Interventions	Results and statistical analysis	Effect size	Favours
<b>Haematoma</b>					
[17] Systematic review	190 people 5 RCTs in this analysis	<b>Haematoma</b> with <b>TAPP laparoscopic repair</b> with <b>open mesh repair</b>	RR 1.07 95% CI 0.51 to 2.21 See further information on studies for discussion of clinical relevance of results	↔	Not significant
[29] RCT	147 patients with recurrent inguinal hernia	<b>Haematoma , at 1 week</b>  7% with TAPP laparoscopic repair 22% with open mesh repair Absolute numbers not reported	P = 0.009	○○○	TAPP laparoscopic repair
[28] RCT <b>3-armed trial</b>	82 men with recurrent inguinal hernia  The remaining arm evaluated <b>totally</b>	<b>Haematoma</b>  4/24 (17%) with TAPP laparoscopic repair 12/32 (38%) with open mesh repair			

Ref (type)	Population	Outcome, Interventions	Results and statistical analysis	Effect size	Favours
	extraperitoneal (TEP) repair				
<b>Seroma</b>					
[17] Systematic review	186 people 5 RCTs in this analysis	<b>Seroma</b> with TAPP laparoscopic repair with open mesh repair	RR 1.45 95% CI 0.75 to 2.82 See further information on studies for discussion of clinical relevance of results	↔	Not significant
[29] RCT	147 patients with recurrent inguinal hernia	<b>Seroma , at 1 week</b> 0% with TAPP laparoscopic repair 1% with open mesh repair	P = 0.5	↔	Not significant
[29] RCT	147 patients with recurrent inguinal hernia	<b>Seroma , at 3 months</b> 1% with TAPP laparoscopic repair 0% with open mesh repair	P = 0.504	↔	Not significant
<b>Infection</b>					
[17] Systematic review	190 people 5 RCTs in this analysis	<b>Superficial infection</b> with TAPP laparoscopic repair with open mesh repair	RR 0.60 95% CI 0.24 to 1.54 See further information on studies for discussion of clinical relevance of results	↔	Not significant
[29] RCT	147 patients with recurrent inguinal hernia	<b>Infection , at 1 week</b> 1% with TAPP laparoscopic repair 3% with open mesh repair Absolute numbers not reported	P = 0.975	↔	Not significant
[28] RCT 3-armed trial	82 men with recurrent inguinal hernia The remaining arm evaluated totally extraperitoneal (TEP) repair	<b>Infection</b> 0/24 (0%) with TAPP laparoscopic repair 1/32 (3%) with open mesh repair			
<b>Injury</b>					
[17] Systematic review	113 people 4 RCTs in this analysis	<b>Visceral injury</b> with TAPP laparoscopic repair with open mesh repair	RR 2.18 95% CI 0.10 to 46.92 See further information on studies for discussion of clinical relevance of results	↔	Not significant
<b>Postoperative pain</b>					
[28] RCT 3-armed trial	82 men with recurrent inguinal hernia The remaining arm evaluated totally extraperitoneal (TEP) repair	<b>Median postoperative pain (assessed by visual analogue scale [VAS]: 1, no pain; 10, worst possible pain) , at 24 hours</b> 1 with TAPP laparoscopic repair 4 with open mesh repair	P = 0.001	○○○	TAPP laparoscopic repair

Ref (type)	Population	Outcome, Interventions	Results and statistical analysis	Effect size	Favours
[28] RCT 3-armed trial	82 men with recurrent inguinal hernia  The remaining arm evaluated totally extraperitoneal (TEP) repair	<b>Median postoperative pain (assessed by VAS: 1, no pain; 10, worst possible pain) , at up to 20 days</b>  0 with TAPP laparoscopic repair 2 with open mesh repair	P = 0.001	○○○	TAPP laparoscopic repair
[28] RCT 3-armed trial	82 men with recurrent inguinal hernia  The remaining arm evaluated totally extraperitoneal (TEP) repair	<b>Duration of analgesic requirement</b>  1.9 days with TAPP laparoscopic repair 3.2 days with open mesh repair	P = 0.004	○○○	TAPP laparoscopic repair
[29] RCT	147 patients with recurrent inguinal hernia	<b>Postoperative pain (combined VAS index) , in first week</b>  125 mm with TAPP laparoscopic repair 165 mm with open mesh repair	P = 0.019	○○○	TAPP laparoscopic repair
<b>Numbness</b>					
[17] Systematic review	172 people  5 RCTs in this analysis	<b>Persisting numbness</b>  with TAPP laparoscopic repair with open mesh repair	RR 0.33 95% CI 0.10 to 1.14  See further information on studies for discussion of clinical relevance of results	↔	Not significant
<b>Bleeding</b>					
[28] RCT 3-armed trial	82 men with recurrent inguinal hernia  The remaining arm evaluated totally extraperitoneal (TEP) repair	<b>Bleeding</b>  1/24 (4%) with TAPP laparoscopic repair 2/32 (6%) with open mesh repair			
<b>Perioperative complications</b>					
[28] RCT 3-armed trial	82 men with recurrent inguinal hernia  The remaining arm evaluated totally extraperitoneal (TEP) repair	<b>Perioperative complications (included bleeding, haematoma, and infection)</b>  3/24 (13%) with TAPP laparoscopic repair 12/32 (38%) with open mesh repair	P = 0.038	○○○	TAPP laparoscopic repair

### TAPP laparoscopic repair versus open suture repair:

We found one systematic review (search date 2002).<sup>[15]</sup>

#### Pain

*TAPP laparoscopic repair compared with open suture repair* We don't know how TAPP laparoscopic repair and open suture repair compare at reducing persisting pain after 3 months (low-quality evidence).

Ref (type)	Population	Outcome, Interventions	Results and statistical analysis	Effect size	Favours
<b>Pain</b>					
[15] Systematic review	53 people 2 RCTs in this analysis	<b>Persisting pain , after 3 months</b> with <a href="#">TAPP laparoscopic repair</a> with <a href="#">open suture repair</a>	OR 0.18 95% CI 0 to 9.42 See further information on studies for discussion of clinical relevance of results	↔	Not significant

**Hospitalisation**

*TAPP laparoscopic repair compared with open suture repair* We don't know how [TAPP laparoscopic repair](#) and [open suture repair](#) compare at reducing length of hospital stay ([low-quality evidence](#)).

Ref (type)	Population	Outcome, Interventions	Results and statistical analysis	Effect size	Favours
<b>Hospital stay</b>					
[15] Systematic review	92 people 4 RCTs in this analysis	<b>Length of hospital stay</b> with <a href="#">TAPP laparoscopic repair</a> with <a href="#">open suture repair</a>	WMD +0.08 days 95% CI -0.25 days to +0.41 days See further information on studies for discussion of clinical relevance of results	↔	Not significant

**Return to normal activities/work**

*TAPP laparoscopic repair compared with open suture repair* We don't know how [TAPP laparoscopic repair](#) and [open suture repair](#) compare at reducing time to return to normal activities ([low-quality evidence](#)).

Ref (type)	Population	Outcome, Interventions	Results and statistical analysis	Effect size	Favours
<b>Return to normal activities</b>					
[15] Systematic review	57 people 3 RCTs in this analysis	<b>Time to return to usual activities</b> with <a href="#">TAPP laparoscopic repair</a> with <a href="#">open suture repair</a>	HR 0.70 95% CI 0.41 to 1.20 See further information on studies for discussion of clinical relevance of results	↔	Not significant

**Recurrence**

*Compared with open suture repair* We don't know how [TAPP laparoscopic repair](#) and [open suture repair](#) compare at reducing further hernia recurrence ([low-quality evidence](#)).

Ref (type)	Population	Outcome, Interventions	Results and statistical analysis	Effect size	Favours
<b>Further recurrence</b>					
[15] Systematic review	93 people 4 RCTs in this analysis	<b>Further recurrence</b> with <a href="#">TAPP laparoscopic repair</a> with <a href="#">open suture repair</a>	OR 0.31 95% CI 0.04 to 2.26 See further information on studies for discussion of clinical relevance of results	↔	Not significant

No data from the following reference on this outcome. [15]

**Hernia complications**

No data from the following reference on this outcome. <sup>[15]</sup>

**Quality of life**

No data from the following reference on this outcome. <sup>[15]</sup>

**Adverse effects**

Ref (type)	Population	Outcome, Interventions	Results and statistical analysis	Effect size	Favours
<b>Haematoma</b>					
<sup>[15]</sup> Systematic review	93 people 4 RCTs in this analysis	<b>Haematoma</b> with <a href="#">TAPP laparoscopic repair</a> with <a href="#">open suture repair</a>	OR 1.70 95% CI 0.42 to 6.84 See further information on studies for discussion of clinical relevance of results	↔	Not significant
<b>Seroma</b>					
<sup>[15]</sup> Systematic review	93 people 4 RCTs in this analysis	<b>Seroma</b> with <a href="#">TAPP laparoscopic repair</a> with <a href="#">open suture repair</a>	OR 2.14 95% CI 0.21 to 22.16 See further information on studies for discussion of clinical relevance of results	↔	Not significant
<b>Infection</b>					
<sup>[15]</sup> Systematic review	93 people 4 RCTs in this analysis	<b>Superficial infection</b> with <a href="#">TAPP laparoscopic repair</a> with <a href="#">open suture repair</a>	OR 0.18 95% CI 0 to 9.42 See further information on studies for discussion of clinical relevance of results	↔	Not significant
<sup>[15]</sup> Systematic review	68 people 2 RCTs in this analysis	<b>Deep infection</b> with <a href="#">TAPP laparoscopic repair</a> with <a href="#">open suture repair</a>	OR 0.15 95% CI 0 to 7.71 See further information on studies for discussion of clinical relevance of results	↔	Not significant
<b>Numbness</b>					
<sup>[15]</sup> Systematic review	53 people 2 RCTs in this analysis	<b>Persisting numbness</b> with <a href="#">TAPP laparoscopic repair</a> with <a href="#">open suture repair</a>	OR 0.16 95% CI 0.02 to 1.70 See further information on studies for discussion of clinical relevance of results	↔	Not significant
<b>Vascular or visceral injury</b>					
<sup>[15]</sup> Systematic review	93 people 4 RCTs in this analysis	<b>Vascular or visceral injury</b> 0 with <a href="#">TAPP laparoscopic repair</a> 0 with <a href="#">open suture repair</a>			

**TAPP laparoscopic repair versus TEP laparoscopic repair:**

See option on TEP laparoscopic repair for recurrent inguinal hernia, p 45 .

**Further information on studies**

<sup>[15]</sup> <sup>[17]</sup> The meta-analyses comparing laparoscopic versus open surgery for people with recurrent hernia were based on few data. Therefore, the incidence of several clinically important outcomes, particularly complications, could not be estimated. Similarly, many of the RCTs lacked power to detect clinically important differences in outcomes. Confidence intervals were wide, and the lack of significance for these results should not be taken to imply a lack of clinically important differences between surgical techniques.

**Comment:****Clinical guide:**

There is weak evidence to show that TAPP laparoscopic repair reduces the time taken to return to normal activities compared with open mesh repair. However, this evidence shows no difference between the two groups for persisting pain, further recurrence, or other perioperative complications.

**OPTION****EXPECTANT MANAGEMENT FOR RECURRENT INGUINAL HERNIA**

- For GRADE evaluation of interventions for Inguinal hernia, see table, p 60 .
- We found no direct information from RCTs or cohort studies about expectant management in the treatment of people with recurrent inguinal hernia.

**Benefits and harms****Expectant management versus open suture repair, open mesh repair, or laparoscopic repair:**

We found no systematic review, RCTs, or cohort studies of sufficient quality comparing expectant management versus open suture repair, open mesh repair, or laparoscopic repair.

**Further information on studies****Comment:****Clinical guide:**

Expectant management might be considered a reasonable strategy in people who have only mild symptoms, low risk of hernia complications (see prognosis), or high operative risk. However, we found no reliable evidence about the benefits and risks of expectant management compared with surgery.

**GLOSSARY**

**Expectant management** A policy of no active intervention.

**Totally extraperitoneal (TEP) laparoscopic repair** An operation that uses mesh to repair the weakness in the muscles and fascia through which the hernia sac has protruded. This technique does not involve entering the peritoneum with the laparoscope (compare transabdominal preperitoneal [TAPP] laparoscopic repair). The technique is usually performed under general anaesthetic.

**Transabdominal preperitoneal (TAPP) laparoscopic repair** An operation that uses mesh to repair the weakness in the muscles and fascia through which the hernia sac has protruded. This technique involves entering the peritoneum with the laparoscope, although the repair itself (done with a mesh) is undertaken anterior to the peritoneum. The technique is usually performed under general anaesthetic.

**Low-quality evidence** Further research is very likely to have an important impact on our confidence in the estimate of effect and is likely to change the estimate.

**Moderate-quality evidence** Further research is likely to have an important impact on our confidence in the estimate of effect and may change the estimate.



**Open mesh repair** An open operation in which a synthetic mesh is inserted across the posterior wall of the inguinal canal to repair the weakness in the muscles and fascia through which the hernia sac has protruded. Variants include the Lichtenstein and Stoppa procedures. The technique may be performed under local or regional anaesthetic.

**Open suture repair** An open operation using sutures to repair the weakness in the muscles and fascia through which the hernia sac has protruded. There are many variants of the technique (e.g., Bassini, McVay, Maloney, and Shouldice procedures). The technique is commonly performed under local or regional anaesthetic.

**Short Form 36 (SF-36)** A scale that assesses health-related quality of life across eight domains: limitations in physical activities (physical component); limitations in social activities; limitations in usual role activities due to physical problems; pain; psychological distress and wellbeing (mental health component); limitations in usual role activities because of emotional problems; energy and fatigue; and general health perceptions.

**Very low-quality evidence** Any estimate of effect is very uncertain.

## SUBSTANTIVE CHANGES

**Expectant management for unilateral inguinal hernia:** One RCT comparing open mesh repair versus expectant management added, which found improved health-related quality of life up to one year after operation in people with minimally symptomatic hernias.<sup>[7]</sup> Benefits and harms data enhanced. Categorisation unchanged (Unknown effectiveness).

**Open mesh repair for bilateral inguinal hernia:** One RCT comparing open mesh repair with expectant management added, which found insufficient data in the small proportion of people with bilateral inguinal hernias.<sup>[7]</sup> Benefits and harms data enhanced. Categorisation unchanged (Likely to be beneficial).

**Open mesh repair for recurrent inguinal hernia:** One RCT comparing open mesh repair with expectant management added, which found insufficient data in the small proportion of people with recurrent inguinal hernias.<sup>[7]</sup> Benefits and harms data enhanced. Categorisation unchanged (Likely to be beneficial).

**Open mesh repair for unilateral inguinal hernia:** One RCT comparing open mesh repair versus expectant management added, which found improved health-related quality of life up to one year after operation in men with minimally symptomatic hernias.<sup>[7]</sup> Two RCTs comparing open mesh repair versus open suture repair added; the first found a reduced time off work with mesh repair,<sup>[11]</sup> and the second found a lower rate of hernia recurrence with mesh repair.<sup>[12]</sup> Two RCTs comparing open mesh repair with totally extraperitoneal (TEP) laparoscopic repair added; the first found less analgesic requirement and time off work with TEP laparoscopic repair compared with open mesh repair,<sup>[13]</sup> but the second found no significant difference.<sup>[14]</sup> Two RCTs comparing open mesh repair versus transabdominal preperitoneal (TAPP) laparoscopic repair added; the first RCT found that TAPP laparoscopic repair took more time to perform,<sup>[14]</sup> and the second RCT found reduced nerve damage with TAPP repair.<sup>[12]</sup> Benefits and harms data enhanced. Categorisation unchanged (Beneficial).

**Open suture repair for unilateral inguinal hernia:** Two RCTs comparing open mesh repair versus open suture repair added. The first RCT found a reduced time off work,<sup>[11]</sup> and the subsequent RCT found a lower rate of hernia recurrence,<sup>[12]</sup> with mesh repair as compared with open suture repair. One RCT<sup>[12]</sup> found no significant difference in recurrence after 4 years, and one follow-up of a previous RCT<sup>[25]</sup> found no significant difference in discomfort after 5 years, with TAPP laparoscopic repair as compared with open suture repair. Benefits and harms data enhanced. Categorisation unchanged (Likely to be beneficial).

**TAPP laparoscopic repair for recurrent inguinal hernia:** One RCT<sup>[29]</sup> added, which found no significant difference in recurrence rates or chronic pain between TAPP laparoscopic repair and open mesh repair, but decreased postoperative pain and sick leave in the TAPP group. Benefits and harms data enhanced. Categorisation unchanged (Likely to be beneficial).

**Totally extraperitoneal (TEP) laparoscopic repair for unilateral inguinal hernia:** Two RCTs comparing TEP laparoscopic repair with open mesh repair added. The first found less analgesic requirement and time off work with TEP laparoscopic repair,<sup>[13]</sup> but the subsequent RCT found no significant difference between TEP laparoscopic repair and open mesh repair in lost work days.<sup>[14]</sup> One systematic review<sup>[20]</sup> and one subsequent RCT<sup>[14]</sup> found no significant difference between TEP laparoscopic repair and transabdominal preperitoneal (TAPP) laparoscopic repair. Benefits and harms data enhanced. Categorisation unchanged (Beneficial).

**Transabdominal preperitoneal (TAPP) laparoscopic repair for unilateral hernia:** One RCT<sup>[12]</sup> and one follow-up of a previous RCT<sup>[25]</sup> comparing TAPP laparoscopic repair with open suture repair added, which found no significant difference in recurrence after 4 years<sup>[12]</sup> or discomfort after 5 years.<sup>[25]</sup> Two RCTs comparing open mesh repair versus TAPP laparoscopic repair added; the first found that TAPP laparoscopic repair took more time to perform,<sup>[14]</sup> and the second found reduced nerve damage with TAPP repair<sup>[12]</sup> as compared with mesh repair. One systematic review<sup>[20]</sup> and one subsequent RCT<sup>[14]</sup> found no significant difference between totally extraperitoneal (TEP) laparoscopic repair compared with TAPP laparoscopic repair. Benefits and harms data enhanced. Categorisation unchanged (Beneficial).

## REFERENCES

1. NICE. Laparoscopic surgery for inguinal hernia repair. September 2004. <http://guidance.nice.org.uk/TA83> (last accessed 5 April 2006).

2. Department of Health. Hospital Episode Statistics, England: Financial year 2002–03. <http://www.hesonline.nhs.uk/Ease/servlet/ContentServer?siteID=1937> (last accessed 5 April 2006).
3. Rutkow IM, Robbins AW. Demographic, classificatory, and socioeconomic aspects of hernia repair in the United States. *Surg Clin North Am* 1993;73:413–426. [PubMed]
4. Royal College of General Practitioners. Morbidity statistics from general practice. Fourth national study. London, UK: HMSO, 1995.
5. Rai S, Chandra SS, Smile SR. A study of the risk of strangulation and obstruction in groin hernias. *Aust N Z J Surg* 1998;68:650–654. [PubMed]
6. Fitzgibbons RJ Jr, Giobbie-Hurder A, Gibbs JO, et al. Watchful waiting vs repair of inguinal hernia in minimally symptomatic men: a randomized clinical trial. *JAMA* 2006;295:285–292. [PubMed]
7. O'Dwyer PJ, Norrie J, Alani A, et al. Observation or operation for patients with an asymptomatic inguinal hernia: a randomized clinical trial. *Ann Surg* 2006;244:167–173. [PubMed]
8. Scott N, McCormack K, Graham P, et al on behalf of the EU Hernia Trialists Collaboration. Open mesh versus non-mesh for groin hernia repair. In: The Cochrane Library: Issue 3, 2007. Chichester, UK: John Wiley & Sons, Ltd. Search date 2000.
9. Koukourou A, Lyon W, Rice J, et al. Prospective randomized trial of polypropylene mesh compared with nylon darn in inguinal hernia repair. *Br J Surg* 2001;88:931–934. [PubMed]
10. Prieto-Diaz-Chavez E, Medina-Chavez JL, Gonzalez-Ojeda A, et al. Tension-free hernioplasty versus conventional hernioplasty for inguinal hernia repair. *Surg Today* 2005;35:1047–1053. [PubMed]
11. Harjai MM, Nagpal BM, Singh P, et al. A prospective randomized controlled study of Lichtenstein's tension free versus modified Bassini repair in the management of groin hernias. *Med J Arm For India* 2007;63:40–43.
12. Butters M, Redecke J, Koninger J. Long-term results of a randomized clinical trial of Shouldice, Lichtenstein and transabdominal preperitoneal hernia repairs. *Br J Surg* 2007;94:562–565. [PubMed]
13. Eklund A, Rudberg C, Smedberg S, et al. Short-term results of a randomized clinical trial comparing Lichtenstein open repair with totally extraperitoneal laparoscopic inguinal hernia repair. *Br J Surg* 2006;93:1060–1068. [PubMed]
14. Butler RE, Burke R, Schneider JJ, et al. The economic impact of laparoscopic inguinal hernia repair: Results of a double-blinded, prospective, randomized trial. *Surg Endosc* 2007;21:387–390. [PubMed]
15. McCormack K, Scott NW, Go PMNYH, et al on behalf of the EU Hernia Trialists Collaboration. Laparoscopic techniques versus open techniques for inguinal hernia repair. In: The Cochrane Library: Issue 3, 2007. Chichester, UK: John Wiley & Sons, Ltd. Search date 2002.
16. Wennstrom I, Berggren P, Akerud L, et al. Equal results with laparoscopic and Shouldice repairs of primary inguinal hernia in men. Report from a prospective randomised study. *Scand J Surg* 2004;93:34–36. [PubMed]
17. McCormack K, Wake B, Perez J, et al. Laparoscopic surgery for inguinal hernia repair: systematic review of effectiveness and economic evaluation. *Health Technol Assess* 2005;9:1–203. Search date 2003; primary sources Medline, Embase, The Cochrane Library, Cinahl, Biosis, Science Citation Index, Web of Science Proceedings, HTA database, Journals@Ovid Full Text, Springerlink, National Research Register, Clinical Trials, Current Controlled Trials, Research Findings Register, conference proceedings, hand searches of references, and contact with experts.
18. Gokaip A, Inal M, Maralcan G, et al. A prospective randomized study of Lichtenstein open tension-free versus laparoscopic totally extraperitoneal techniques for inguinal hernia repair. *Acta Chir Belg* 2003;103:502–506. [PubMed]
19. Heikkinen T, Bringham S, Ohtonen P, et al. Five-year outcome of laparoscopic and Lichtenstein hernioplasties. *Surg Endosc* 2004;18:518–522. [PubMed]
20. Wake BL, McCormack K, Fraser C, et al. Transabdominal pre-peritoneal (TAPP) vs totally extraperitoneal (TEP) laparoscopic techniques for inguinal hernia repair. In: The Cochrane Library, Issue 3, 2007. Chichester, UK: John Wiley & Sons, Ltd. Search date 2003.
21. Koninger J, Redecke J, Butters M. Chronic pain after hernia repair: a randomized trial comparing Shouldice, Lichtenstein and TAPP. *Langenbecks Arch Surg* 2004;389:361–365. [PubMed]
22. Lorenz D, Stark E, Oestreich K, et al. Laparoscopic hernioplasty versus conventional hernioplasty (Shouldice): results of a prospective randomized trial. *World J Surg* 2000;24:739–746. [PubMed]
23. Berndsen F, Arvidsson D, Enander LK, et al. Postoperative convalescence after inguinal hernia surgery: prospective randomized multicenter study of laparoscopic versus Shouldice inguinal hernia repair in 1042 patients. *Hernia* 2002;6:56–61. [PubMed]
24. Arvidsson D, Berndsen FH, Larsson LG, et al. Randomized clinical trial comparing 5-year recurrence rate after laparoscopic versus Shouldice repair of primary inguinal hernia. *Br J Surg* 2005;92:1085–1091. [PubMed]
25. Berndsen FHP, Petersson U, Arvidsson D, et al. Discomfort five years after laparoscopic and Shouldice inguinal hernia repair: a randomised trial with 867 patients. A report from the SMIL study group. *Hernia* 2007;11:307–313. [PubMed]
26. Anadol ZA, Ersoy E, Taneri F, et al. Outcome and cost comparison of laparoscopic transabdominal preperitoneal hernia repair versus open Lichtenstein technique. *J Laparoendosc Adv Surg Tech A* 2004;14:159–163. [PubMed]
27. Wellwood J, Sculpher MJ, Stoker D, et al. Randomised controlled trial of laparoscopic versus open mesh repair for inguinal hernia: outcome and cost. *BMJ* 1998;317:103–110. [Erratum in: *BMJ* 1998;317:631] [PubMed]
28. Dedemadi G, Sgourakis G, Karaliotis C, et al. Comparison of laparoscopic and open tension-free repair of recurrent inguinal hernias: a prospective randomized study. *Surg Endosc* 2006;20:1099–1104. [PubMed]
29. Eklund A, Rudberg C, Leijonmarck CE, et al. Recurrent inguinal hernia: randomized multicenter trial comparing laparoscopic and Lichtenstein repair. *Surg Endosc* 2007;21:634–640. [PubMed]

## Sanjay Purkayastha

Clinical Research Fellow  
Department of Biosurgery and Surgical Technology  
Imperial College, St Mary's Hospital  
London  
UK

## Andre Chow

Senior House Officer  
Department of Biosurgery and Surgical Technology  
Imperial College, St Mary's Hospital  
London  
UK

## Thanos Athanasiou

Senior Lecturer and Consultant Surgeon  
Department of Biosurgery and Surgical Technology  
Imperial College, St Mary's Hospital  
London  
UK

## Paris P Tekkis

Professor of Colorectal Surgery  
Royal Marsden and Chelsea and Westminster Hospitals  
Imperial College  
London  
UK

**Ara Darzi**

Professor of Surgery and Head of Department  
Department of Biosurgery and Surgical Technology  
Imperial College, St Mary's Hospital  
London  
UK

Competing interests: AC, SP, TA, PT, and AD declare that they have no competing interests.  
*We would like to acknowledge the previous contributors of this review, including Bazian Ltd.*

## Disclaimer

The information contained in this publication is intended for medical professionals. Categories presented in Clinical Evidence indicate a judgement about the strength of the evidence available to our contributors prior to publication and the relevant importance of benefit and harms. We rely on our contributors to confirm the accuracy of the information presented and to adhere to describe accepted practices. Readers should be aware that professionals in the field may have different opinions. Because of this and regular advances in medical research we strongly recommend that readers' independently verify specified treatments and drugs including manufacturers' guidance. Also, the categories do not indicate whether a particular treatment is generally appropriate or whether it is suitable for a particular individual. Ultimately it is the readers' responsibility to make their own professional judgements, so to appropriately advise and treat their patients. To the fullest extent permitted by law, BMJ Publishing Group Limited and its editors are not responsible for any losses, injury or damage caused to any person or property (including under contract, by negligence, products liability or otherwise) whether they be direct or indirect, special, incidental or consequential, resulting from the application of the information in this publication.

**GRADE** Evaluation of interventions for Inguinal hernia.

Important outcomes		Adverse effects, Hernia complications, Hospitalisation, Pain, Quality of life, Recurrence, Return to normal activities/work							
Studies (Participants)	Outcome	Comparison	Type of evidence	Quality	Consistency	Directness	Effect size	GRADE	Comment
<i>What are the effects of elective treatments for primary unilateral inguinal hernia in adults?</i>									
2 (880) <sup>[6]</sup> <sup>[7]</sup>	Pain	Open mesh repair versus expectant management (in people with minimally symptomatic hernia)	4	-1	0	-2	0	Very low	Quality point deducted for subsequent crossover between groups. Directness points deducted for restricted population and inclusion of people with recurrent hernia
1 (720) <sup>[6]</sup>	Hernia complications	Open mesh repair versus expectant management (in people with minimally symptomatic hernia)	4	-1	0	-2	0	Very low	Quality point deducted for subsequent crossover between groups. Directness points deducted for restricted population and inclusion of people with recurrent hernia
2 (880) <sup>[6]</sup> <sup>[7]</sup>	Quality of life	Open mesh repair versus expectant management (in people with minimally symptomatic hernia)	4	-1	-1	-2	0	Very low	Quality point deducted for subsequent crossover between groups. Consistency point deducted for conflicting results. Directness points deducted for restricted population and inclusion of people with recurrent hernia
9 (2393) <sup>[8]</sup>	Pain	Open mesh repair versus open suture repair	4	0	-1	-1	0	Low	Consistency point deducted for heterogeneity between RCTs. Directness point deducted for inclusion of people other than with primary unilateral hernia
19 (4035) <sup>[8]</sup> <sup>[10]</sup> <sup>[11]</sup>	Hospitalisation	Open mesh repair versus open suture repair	4	0	-1	-2	0	Very low	Consistency point deducted for heterogeneity between studies. Directness points deducted for uncertainty about clinical relevance of improvement and for inclusion of people other than with primary unilateral hernia
11 (1681) <sup>[8]</sup> <sup>[9]</sup> <sup>[10]</sup> <sup>[11]</sup>	Return to normal activities/work	Open mesh repair versus open suture repair	4	0	-1	-2	0	Very low	Consistency point deducted for heterogeneity between studies. Directness points deducted for uncertainty about clinical relevance of improvement and for inclusion of people other than with primary unilateral hernia
22 (5120) <sup>[8]</sup> <sup>[9]</sup> <sup>[10]</sup> <sup>[11]</sup> <sup>[12]</sup>	Recurrence	Open mesh repair versus open suture repair	4	-1	0	-1	0	Low	Quality point deducted for incomplete reporting of results. Directness point deducted for inclusion of people other than with primary unilateral hernia
at least 20 (at least 4198) <sup>[8]</sup> <sup>[9]</sup> <sup>[10]</sup> <sup>[12]</sup>	Adverse effects	Open mesh repair versus open suture repair	4	-1	0	-1	0	Low	Quality point deducted for incomplete reporting of results. Directness point deducted for inclusion of people other than with primary unilateral hernia
3 (759) <sup>[15]</sup> <sup>[16]</sup>	Pain	TEP laparoscopic repair versus open suture repair	4	-1	-1	0	0	Low	Quality point deducted for incomplete reporting of results. Consistency point deducted for different results at different endpoints

Important outcomes		Adverse effects, Hernia complications, Hospitalisation, Pain, Quality of life, Recurrence, Return to normal activities/work							
Studies (Participants)	Outcome	Comparison	Type of evidence	Quality	Consistency	Directness	Effect size	GRADE	Comment
5 (1582) <sup>[15]</sup> <sup>[16]</sup>	Hospitalisation	TEP laparoscopic repair versus open suture repair	4	0	0	-2	0	Low	Directness points deducted for uncertainty about clinical relevance of result and for inclusion of people with recurrent and bilateral inguinal hernia and femoral hernia
1 (94) <sup>[15]</sup>	Return to normal activities/work	TEP laparoscopic repair versus open suture repair	4	-1	0	0	0	Moderate	Quality point deducted for sparse data
6 (1763) <sup>[15]</sup> <sup>[16]</sup>	Recurrence	TEP laparoscopic repair versus open suture repair	4	-1	0	0	0	Moderate	Quality point deducted for incomplete reporting of results
at least 4 (at least 1598) <sup>[15]</sup> <sup>[16]</sup>	Adverse effects	TEP laparoscopic repair versus open suture repair	4	-1	0	0	0	Moderate	Quality point deducted for incomplete reporting of results
5 (2362) <sup>[17]</sup> <sup>[13]</sup>	Pain	TEP laparoscopic repair versus open mesh repair	4	-1	0	0	0	Moderate	Quality point deducted for incomplete reporting of results
11 (less than 2787) <sup>[17]</sup> <sup>[13]</sup> <sup>[14]</sup> <sup>[18]</sup>	Hospitalisation	TEP laparoscopic repair versus open mesh repair	4	-1	-1	0	0	Low	Quality point deducted for methodological weakness in meta-analysis. Consistency point deducted for different results for different outcome measures
10 (less than 2413) <sup>[17]</sup> <sup>[13]</sup> <sup>[14]</sup> <sup>[18]</sup>	Return to normal activities/work	TEP laparoscopic repair versus open mesh repair	4	-2	0	0	0	Low	Quality points deducted for methodological weaknesses in meta-analysis and no direct statistical comparison between groups
16 (less than 3586) <sup>[17]</sup> <sup>[13]</sup> <sup>[14]</sup> <sup>[18]</sup>	Recurrence	TEP laparoscopic repair versus open mesh repair	4	-1	0	0	0	Moderate	Quality point deducted for incomplete reporting of results
at least 12 (at least 3243) <sup>[17]</sup> <sup>[13]</sup> <sup>[18]</sup>	Adverse effects	TEP laparoscopic repair versus open mesh repair	4	-1	0	0	0	Moderate	Quality point deducted for incomplete reporting of results
2 (less than 118) <sup>[20]</sup> <sup>[14]</sup>	Hospitalisation	TEP laparoscopic repair versus TAPP laparoscopic repair	4	-3	0	0	0	Very low	Quality points deducted for sparse data, no statistical analysis between groups, and incomplete reporting of results
1 (less than 66) <sup>[14]</sup>	Return to normal activities/work	TEP laparoscopic repair versus TAPP laparoscopic repair	4	-2	0	0	0	Low	Quality points deducted for sparse data and incomplete reporting of results
1 (52) <sup>[20]</sup>	Recurrence	TEP laparoscopic repair versus TAPP laparoscopic repair	4	-2	0	0	0	Low	Quality point deducted for sparse data and incomplete reporting of results
8 (1233) <sup>[15]</sup>	Pain	TAPP laparoscopic repair versus open suture repair	4	-1	0	0	0	Moderate	Quality point deducted for incomplete reporting of results
13 (at least 1586) <sup>[15]</sup> <sup>[23]</sup>	Hospitalisation	TAPP laparoscopic repair versus open suture repair	4	-2	-1	0	0	Very low	Quality points deducted for incomplete reporting of results and uncertainty about clinical relevance of improvement. Consistency point deducted for heterogeneity between RCTs
8 (1770) <sup>[15]</sup> <sup>[23]</sup>	Return to normal activities/work	TAPP laparoscopic repair versus open suture repair	4	-2	-1	0	0	Very low	Quality points deducted for incomplete reporting of results and uncertainty about clinical relevance of improvement. Consistency point deducted for heterogeneity between RCTs

Important outcomes		Adverse effects, Hernia complications, Hospitalisation, Pain, Quality of life, Recurrence, Return to normal activities/work							
Studies (Participants)	Outcome	Comparison	Type of evidence	Quality	Consistency	Directness	Effect size	GRADE	Comment
19 (less than 3757) [15] [22] [23] [24] [12]	Recurrence	TAPP laparoscopic repair versus open suture repair	4	-1	-1	0	0	Low	Quality point deducted for incomplete reporting. Consistency point deducted for conflicting results
8 (1550) [17]	Pain	TAPP laparoscopic repair versus open mesh repair	4	-1	0	0	0	Moderate	Quality point deducted for incomplete reporting of results
2 (less than 116) [14] [26]	Hospitalisation	TAPP laparoscopic repair versus open mesh repair	4	-2	0	0	0	Low	Quality points deducted for sparse data and incomplete reporting
9 (less than 1091) [17] [14]	Return to normal activities/work	TAPP laparoscopic repair versus open mesh repair	4	-2	0	0	0	Low	Quality points deducted for incomplete reporting and statistical uncertainty of result on sensitivity analysis
17 (less than 2444) [17] [12] [26]	Recurrence	TAPP laparoscopic repair versus open mesh repair	4	-1	0	0	0	Moderate	Quality point deducted for incomplete reporting
at least 15 (at least 1902) [17] [14] [26] [21]	Adverse effects	TAPP laparoscopic repair versus open mesh repair	4	-2	0	0	0	Low	Quality points deducted for incomplete reporting and statistical uncertainty of result on sensitivity analysis
<i>What are the effects of elective treatments for primary bilateral inguinal hernia in adults?</i>									
2 (46) [8]	Hospitalisation	Open mesh repair versus open suture repair	4	-2	0	0	0	Low	Quality points deducted for sparse data and incomplete reporting of results
2 (46) [8]	Recurrence	Open mesh repair versus open suture repair	4	-2	0	0	0	Low	Quality points deducted for sparse data and incomplete reporting of results
2 (74) [17]	Pain	TEP laparoscopic repair versus open mesh repair	4	-2	0	0	0	Low	Quality points deducted for sparse data and incomplete reporting of results
3 (73) [17]	Return to normal activities/work	TEP laparoscopic repair versus open mesh repair	4	-2	0	0	0	Low	Quality points deducted for sparse data and incomplete reporting of results
3 (110) [17]	Recurrence	TEP laparoscopic repair versus open mesh repair	4	-2	0	0	0	Low	Quality points deducted for sparse data and incomplete reporting of results
3 (86) [17]	Pain	TAPP laparoscopic repair versus open mesh repair	4	-2	0	0	0	Low	Quality points deducted for sparse data and incomplete reporting of results
6 (107) [17]	Hospitalisation	TAPP laparoscopic repair versus open mesh repair	4	-2	0	0	0	Low	Quality points deducted for sparse data and incomplete reporting of results
6 (87) [17]	Return to normal activities/work	TAPP laparoscopic repair versus open mesh repair	4	-2	0	0	0	Low	Quality points deducted for sparse data and incomplete reporting of results
7 (152) [17]	Recurrence	TAPP laparoscopic repair versus open mesh repair	4	-2	0	0	0	Low	Quality points deducted for sparse data and incomplete reporting of results
6 (140) [17]	Adverse effects	TAPP laparoscopic repair versus open mesh repair	4	-2	0	0	0	Low	Quality points deducted for sparse data and incomplete reporting of results
2 (63) [15]	Pain	TAPP laparoscopic repair versus open suture repair	4	-2	0	0	0	Low	Quality points deducted for sparse data and incomplete reporting of results
4 (97) [15]	Hospitalisation	TAPP laparoscopic repair versus open suture repair	4	-2	0	0	0	Low	Quality points deducted for sparse data and incomplete reporting of results

Important outcomes		Adverse effects, Hernia complications, Hospitalisation, Pain, Quality of life, Recurrence, Return to normal activities/work							
Studies (Participants)	Outcome	Comparison	Type of evidence	Quality	Consistency	Directness	Effect size	GRADE	Comment
3 (59) <sup>[15]</sup>	Return to normal activities/work	TAPP laparoscopic repair versus open suture repair	4	-2	0	0	0	Low	Quality points deducted for sparse data and incomplete reporting of results
at least 4 (at least 97) <sup>[15]</sup>	Adverse effects	TAPP laparoscopic repair versus open suture repair	4	-2	0	0	0	Low	Quality points deducted for sparse data and incomplete reporting of results
<i>What are the effects of elective treatments for recurrent inguinal hernia in adults?</i>									
2 (49) <sup>[8]</sup>	Pain	Open mesh repair versus open suture repair	4	-2	0	0	0	Low	Quality points deducted for sparse data and incomplete reporting of results
2 (59) <sup>[8]</sup>	Hospitalisation	Open mesh repair versus open suture repair	4	-2	0	0	0	Low	Quality points deducted for sparse data and incomplete reporting of results
2 (33) <sup>[8]</sup>	Return to normal activities/work	Open mesh repair versus open suture repair	4	-2	0	0	0	Low	Quality points deducted for sparse data and incomplete reporting of results
2 (59) <sup>[8]</sup>	Recurrence	Open mesh repair versus open suture repair	4	-2	0	0	0	Low	Quality points deducted for sparse data and incomplete reporting of results
2 (122) <sup>[17]</sup>	Pain	TEP laparoscopic repair versus open mesh repair	4	-2	-1	0	0	Very low	Quality points deducted for sparse data and incomplete reporting of results. Consistency point deducted for conflicting results
3 (less than 170) <sup>[17]</sup> <sup>[28]</sup>	Hospitalisation	TEP laparoscopic repair versus open mesh repair	4	-2	0	0	0	Low	Quality points deducted for sparse data and incomplete reporting of results
4 (less than 179) <sup>[17]</sup> <sup>[28]</sup>	Return to normal activities/work	TEP laparoscopic repair versus open mesh repair	4	-2	0	0	0	Low	Quality points deducted for sparse data and incomplete reporting of results
3 (185) <sup>[17]</sup> <sup>[28]</sup>	Recurrence	TEP laparoscopic repair versus open mesh repair	4	-2	0	0	0	Low	Quality points deducted for sparse data and incomplete reporting of results
3 (at least 175) <sup>[17]</sup> <sup>[28]</sup>	Adverse effects	TEP laparoscopic repair versus open mesh repair	4	-2	0	0	0	Low	Quality points deducted for sparse data and incomplete reporting of results
5 (311) <sup>[17]</sup> <sup>[29]</sup>	Pain	TAPP laparoscopic repair versus open mesh repair	4	-1	-1	0	0	Low	Quality point deducted for incomplete reporting. Consistency point deducted for conflicting results
7 (less than 280) <sup>[17]</sup> <sup>[28]</sup>	Hospitalisation	TAPP laparoscopic repair versus open mesh repair	4	-1	0	0	0	Moderate	Quality point deducted for incomplete reporting
8 (less than 350) <sup>[17]</sup> <sup>[28]</sup> <sup>[29]</sup>	Return to normal activities/work	TAPP laparoscopic repair versus open mesh repair	4	-1	0	0	0	Moderate	Quality point deducted for incomplete reporting
8 (402) <sup>[17]</sup> <sup>[28]</sup> <sup>[29]</sup>	Recurrence	TAPP laparoscopic repair versus open mesh repair	4	-1	0	0	0	Moderate	Quality point deducted for incomplete reporting of results
2 (53) <sup>[15]</sup>	Pain	TAPP laparoscopic repair versus open suture repair	4	-2	0	0	0	Low	Quality points deducted for sparse data and incomplete reporting of results
4 (92) <sup>[15]</sup>	Hospitalisation	TAPP laparoscopic repair versus open suture repair	4	-2	0	0	0	Low	Quality points deducted for sparse data and incomplete reporting of results
3 (57) <sup>[15]</sup>	Return to normal activities/work	TAPP laparoscopic repair versus open suture repair	4	-2	0	0	0	Low	Quality points deducted for sparse data and incomplete reporting of results

Important outcomes		Adverse effects, Hernia complications, Hospitalisation, Pain, Quality of life, Recurrence, Return to normal activities/work							
Studies (Participants)	Outcome	Comparison	Type of evidence	Quality	Consistency	Directness	Effect size	GRADE	Comment
4 (93) <sup>[15]</sup>	Recurrence	TAPP laparoscopic repair versus open suture repair	4	-2	0	0	0	Low	Quality points deducted for sparse data and incomplete reporting of results

We initially allocate 4 points to evidence from RCTs, and 2 points to evidence from observational studies. To attain the final GRADE score for a given comparison, points are deducted or added from this initial score based on preset criteria relating to the categories of quality, directness, consistency, and effect size. Quality: based on issues affecting methodological rigour (e.g., incomplete reporting of results, quasi-randomisation, sparse data [ $<200$  people in the analysis]). Consistency: based on similarity of results across studies. Directness: based on generalisability of population or outcomes. Effect size: based on magnitude of effect as measured by statistics such as relative risk, odds ratio, or hazard ratio.