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Appendicectomy: who performs it, when and how?

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ABSTRACT

A comparative review of changing patterns between 1997 and 2002 of who performs appendicectomy and a snapshot of the surgical approaches in use. It also indicates the stage at which competency in appendicectomy may be achieved by contemporary trainees in surgery and anaesthesia.

KEYWORDS

Appendicectomy – Training – Changing patterns

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Appendicectomy is one of the most common operations performed as an emergency. The operation has traditionally been delegated to relatively junior doctors and competency is usually seen as a sign of the junior's progress. In 1997, NCEPOD (formerly The National Confidential Enquiry into Perioperative Deaths) conducted a study[1] entitled *Who Operates When?* At that time, 33% of appendicectomies in adults were performed by senior house officers and 42% by registrars in their early years of training. Seveny-four percent of patients were anaesthetised by trainees in anaesthesia in the same grades.

In spring 2002, NCEPOD performed a similar exercise, collecting data on 72,343 surgical procedures performed over a 7-day period from 557 hospitals.[2] This included nearly 800 appendicectomies, allowing us to review in detail who now performs appendicectomy and providing a snapshot of the surgical approaches in use. It also informs us about the stage at which competency in appendicectomy may be achieved by contemporary trainees in surgery and anaesthesia.

Patients and Methods

In September 2001, chief executives of all relevant hospitals in England, Wales, Northern Ireland, the Isle of Man, Guernsey, Jersey, the Ministry of Defence and the independent sector were asked to identify a reporter to provide data on surgical procedures to NCEPOD. Each participating hospital was randomly assigned a 7-day period within March or April 2002 during which to complete questionnaires on all surgical procedures. During the designated 7-day period, hospitals were asked to complete a questionnaire for every theatre case or operative procedure performed within an operating theatre. In this paper, we consider completed appendicectomies only, and have excluded diagnostic procedures if no appendicectomy was performed.

Results

Age and gender

Appendicectomy was performed more frequently in males than females (416:355) at all ages below 80 years. More than half of all appendicectomies were performed on patients aged 10–29 years. Appendicectomy was uncommon after the age of 60 years.

Seniority of staff

Six children under the age of 5 years underwent appendicectomy; there was a consultant anaesthetist present for four and two were anaesthetised by year 1 or 2 specialist registrars. The situation was the same with regard to grade of surgeon. Of the 211 children aged 5–15 years, for 78 procedures the most senior anaesthetist present was a senior house officer and a further 13 were anaesthetised by a year 1 or 2 specialist registrar. In contrast, only 23 operations were performed by unsupervised senior house officers and 38 by year 1 or 2 specialist registrars. A consultant anaesthetist was present for 51 cases and a consultant surgeon for 39 cases.

The results for adults are also striking and are shown in Tables 1 and 2. Adult patients undergoing appendicectomy are commonly anaesthetised by junior staff but relatively few operations are performed by junior surgeons without a more senior member of staff present. A consultant surgeon or consultant anaesthetist was present at about one quarter of procedures.

Sub-specialty of surgeon

Four of the six children under age 5 years were operated upon by a paediatric surgeon. Children aged 5–15 years were more likely to be operated upon by a surgeon with a 'subspecialty' interest other than paediatric surgery (Table 3).

Table 1 Grade of senior anaesthetist by time of operation: appendicectomies performed during weekdays and weekends on patients aged ≥ 16 years

Anaesthetist	Weekdays			Weekends			Total
	Day	Evening	Night	Day	Evening	Night	
Consultant	118	23	1	13	5	0	160
SAS	29	16	0	9	3	0	57
Specialist registrar							
Year 3+	10	7	1	5	9	1	33
Year 1/2	8	11	2	4	3	2	30
SHO	63	88	13	31	26	10	231
Other	16	12	4	4	1	0	37
Not answered	7	10	1	4	4	0	26
Total	251	167	22	69	51	13	574

Table 2 Grade of senior surgeon by time of operation: appendicectomies performed during weekdays and weekends on patients aged ≥ 16 years

Surgeon	Weekday				Weekend				Total
	Day	Evening	Night	Not answered	Day	Evening	Night	Not answered	
Consultant	92	23	2	0	15	4	1	0	137
SAS	29	35	3	0	8	9	1	0	85
Specialist registrar									
Year 3+	40	31	6	1	13	11	2	0	104
Year 1/2	36	23	3	0	14	10	5	0	91
SHO	11	20	1	0	10	5	2	1	50
Other	27	26	5	1	7	10	1	0	77
Not answered	15	7	2	1	2	2	1	0	30
Total	250	165	22	3	69	51	13	1	574

Day is 08:00 to 17:59, evening is 18:00 to 23:59 and night is 00:00 to 07:59,

Table 3 Specialty of surgeons performing operations on children aged 5–15 years

Surgical specialty	Weekdays			Weekends			Total
	Day	Evening	Night	Day	Evening	Night	
General	43	57	6	21	17	3	147
Orthopaedic and trauma	1	0	0	0	0	0	1
Paediatrics	10	7	1	1	0	0	19
Urology	0	0	0	0	0	0	0
Vascular	4	5	0	5	1	0	15
Other	1	3	0	0	0	0	4
Not answered	7	10	3	3	2	0	25
Total	66	82	10	30	20	3	211

Table 4 Open appendicectomy by age and gender

Age (years)	Male	Female	Indeterminate	Not answered	Total
< 5	2	2	0	0	4
5–15	119	80	0	1	200
≥ 16	263	212	1	4	480
Not answered	3	6	0	8	17
Total	387	300	1	13	701

This needs to be recognised when manpower planning for acute services for children.

Diagnosis and surgical approach

The majority of operations were for uncomplicated appendicitis (or a normal appendix; as the returns did not include copies of pathology forms it is impossible to classify these retrospectively and adequately). Generalised peritonitis was uncommon but was relatively more likely in children, especially boys. Five adults and one child underwent an interval appendicectomy presumably after conservative management of a previous episode of acute appendicitis. As might be expected, consultants were relatively more likely to be present for cases with peritonitis.

As Tables 4–6 show, less than 10% of operations were performed laparoscopically and almost as many patients underwent a laparotomy. What we do not know, however, is how many laparoscopies were performed for suspected appendicitis in patients who were then saved an appendicectomy when the organ was seen to be normal. Neither can we be certain how many open appendicectomies were preceded by diagnostic laparoscopy. Consultants were present for the majority of laparoscopic appendicectomies, illustrating that even where this operation is available it is still considered an operation requiring the skills or supervision of a senior surgeon. Similarly, consultants were present for the majority of patients who had a laparotomy. Interval appendicectomies were performed as an open operation, perhaps because of the expectation of operative difficulty associated with adhesions. In patients with peritonitis, appendicectomy was frequently performed through a laparotomy incision but many patients without peritonitis also had a laparotomy.

Discussion

Appendicectomy remains a commonly performed emergency procedure, the principal indication being a suspicion of acute appendicitis. Although NCEPOD used a slightly different study method when it last looked at this issue,[1] it is clear that consultant surgeons were much less frequently present then, particularly after 6 pm and at weekends. At that time, senior house officers performed about a third of procedures in adults without more senior help in theatre. This also applied to children. It is accepted that, where possible, appendicectomy can be done between the hours of 8 am and midnight; patients seldom require surgery at night. Most appendicectomies are now performed during the day and evening.

In the current study, children under the age of 5 years were generally anaesthetised in the presence of a consultant anaesthetist but we were surprised by the number of children aged 5–15 years who were anaesthetised by relatively junior staff. For adults, a consultant anaesthetist was only present for 28% of cases, usually when the procedure was performed during the daytime on weekdays. A consultant is most likely to be present if the operation is during the

Table 5 Laparoscopy by age and gender

Age (years)	Male	Female	Not answered	Total
< 5	1	0	0	1
5–15	2	7	1	10
≥ 16	12	36	2	50
Total	15	43	3	61

Table 6 Laparotomy by age and gender

Age (years)	Male	Female	Not answered	Total
< 5	1	0	0	1
5–15	1	0	0	1
≥ 16	18	25	1	44
Not answered	0	0	1	1
Total	20	25	2	47

daytime hours and this may reflect training of juniors or an absence of juniors – we cannot tell which from the data. Junior staff are more likely to anaesthetise patients, without a consultant present, during the evening and at night. This is not an issue as long as they have been adequately trained. Few patients were anaesthetised by specialist registrars. This may reflect the commitment of this grade to obstetric and intensive care, rather than general surgical, emergency duties.

It is interesting to note how infrequently surgeons in the senior house officer grade now perform appendicectomy unsupervised. There has been a major shift in working patterns over the last decade with further changes occurring as the *European Working Time Directive* takes effect. Training in the senior house officer grade in general surgery has been shortened and is now more clearly linked with training rotations in many regions. Consequently, doctors spend less time as senior house officers in general surgery and may seldom reach the level of competence required for performing appendicectomy without supervision.

In a survey of 95 surgical senior house officers, the number of appendicectomies performed halved after changing from a traditional on-call rota to a shift rota.[3] The data suggest that apparent competency for open appendicectomy is achieved during the first years of surgical registrar training. This grade performs almost half of all appendicectomies and substantially more of the appendicectomies that are performed during the evening and night.

The operation is now learnt as a registrar and many consultants find themselves performing the same operation that they did as juniors. Hopefully, this will be in a situation where they are passing on their skills to junior staff but with the reduction in junior doctors' hours there is the problem of juniors still finding time for their own training. With shortened training, exposure involvement in procedures such as appendicectomy becomes increasingly important especially as surgeons need to learn to deal with the difficult case as well as the routine. Exposure to sufficient cases for training may not always be possible. To compound this further, it appears that the incidence of admission with appendicitis has fallen significantly over the last decade.[4]

As well as informing us who performs appendicectomy, and when, the data collected by NCEPOD also reveal which surgical approach is used. Most patients with appendicitis were managed by a standard 'gridiron' or curvilinear 'Lanz'-type approach, but a significant number had their appendix removed through a laparotomy incision. Laparotomy wounds carry a higher risk of incisional hernia and morbidity than the standard incision and are likely to be less cosmetic and associated with longer periods of recovery. Where there is doubt about the diagnosis, perhaps because of peritonitis, or concern about the patient's age, clinicians should consider whether further investigation (computed tomography, for example) or diagnostic laparoscopy might help. The need for a laparotomy incision in a patient with appendicitis is likely to be rare and we wonder how many of these cases could have been adequately managed through a standard incision, perhaps with laparoscopy beforehand to confirm the diagnosis?

The data presented here indicate that, at present, most patients who undergo a laparoscopic appendicectomy do so with a consultant present and few are performed by unsupervised juniors. This may imply that few registrars become competent at laparoscopic appendicectomy during their training or very few surgeons have been persuaded of the advantages.

In recent years, some surgeons have championed a move towards laparoscopic appendicectomy.[5] Proponents of the laparoscopic approach cite advantages including more certain diagnosis and minimisation of wound problems. A Cochrane Review of 45 randomised trials demonstrated some potential benefits for the laparoscopic approach[6] but it can be argued that they are minimal and, in most institutions, the laparoscopic approach is probably more expensive than open. Perhaps the greatest barrier to a more generalised use of the laparoscopic approach will be the difficulty reaching competence during training.[7] For example, it is reported that paediatric surgeons may only perform on average 1.6 laparoscopic procedures and assist with 2.3 each year during their 6-year training. If further research supports a move towards laparoscopic appendicectomy, the current workforce will not have been adequately trained for this approach.

This paper has focused on the operation of appendicectomy and we did not review patients who underwent diagnostic laparoscopy for suspected appendicitis in whom the appendix was not removed. A recent retrospective study of laparoscopy for abdominal pain[8] confirmed appendicitis in 910 of 1042 patients thought to have this condition. The normal-looking appendix was removed if no other cause of abdominal pain was found, but no information is given about how many of these were subsequently reclassified as inflamed on pathological examination. The authors accept that this is controversial. Diagnostic laparoscopy is certainly a skill we should teach our trainees but whether or not it is acceptable to remove a normal appendix for training purposes only is another debate!

Conclusions

In recent years, it has become much less common for surgeons in their early years of training to perform an appendicectomy independently. Many patients are, however, anaesthetised by junior anaesthetists. This probably reflects modern training where exposure to emergency appendicectomy is so infrequent that junior surgeons do not acquire competence as early as they did in

the past. In contrast, junior anaesthetists are able to manage many patients with appendicitis as, in general, these patients are relatively young and fit.

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