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Can laparoscopy be part of a paediatric surgery outreach service?

R Peeraully, R Hill, D Colliver, A Williams, S Motiwale, B Davies

Nottingham University Hospitals NHS Trust, UK

ABSTRACT

INTRODUCTION The aim of this study was to assess the outreach laparoscopic service delivered by four paediatric surgeons to a district general hospital (DGH).

METHODS A retrospective review was carried out of all laparoscopic procedures performed in a single DGH between January 2004 and November 2014 by the four paediatric surgeons providing the outreach service. All operations were identified from the electronic theatre system and archived correspondence. Demographic and clinical details were obtained from contemporaneous records.

RESULTS Over the 11-year study period, 1,339 operations were performed as part of the outreach paediatric surgery service, with 128 patients (9.6%) undergoing laparoscopy. The indications for laparoscopic surgery were impalpable unilateral or bilateral undescended testes (UDT) (*n*=79, 62%) or request for insertion of a feeding gastrostomy (*n*=49, 38%). All but six UDT cases (96%) were performed as day surgery and the median length of stay for gastrostomy patients was 3 days (interquartile range: 2–3 days). There were three UDT cases with surgical complications and one had complications related to the anaesthesia. One gastrostomy case required transfer to our tertiary centre for management of postoperative urinary retention and urethral injury.

CONCLUSIONS Elective laparoscopic procedures in young children can be provided safely as components of an outreach paediatric surgery service in a DGH setting as part of an increasing volume of operations performed by specialist paediatric surgeons. This enables children to have a high quality service as close to their home as possible.

KEYWORDS

Laparoscopy – Paediatric surgery – Paediatric urology – Outreach service

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CORRESPONDENCE TO

Riyad Peeraully, E: riyad77@gmail.com

Outreach services to district general hospitals (DGHs) have been increasingly offered by paediatric surgeons based in tertiary centres.[1–4] In addition to undertaking general paediatric surgery operations, these services may also include specific laparoscopic procedures. However, not all outreach services make provision for laparoscopy to be performed in the DGH setting. This retrospective study analysed the provision and outcomes of laparoscopic cases performed in a DGH as part of the outreach service delivered by paediatric surgeons from our tertiary centre.

Methods

Elective general paediatric surgery and laparoscopic procedures carried out in a single DGH (Royal Derby Hospital [RDH]) between January 2004 and November 2014 were identified from the electronic theatre system and archived correspondence. All procedures were performed by one of the four consultant paediatric surgeons providing the outreach service or a trainee under their direct supervision.

Patients assessed as an outpatient in RDH but listed for their laparoscopic procedure in the tertiary centre (for example owing to complex co-morbidities, having significant anaesthesia risk or being expected to require the paediatric intensive care unit [PICU] postoperatively) were excluded. No patients who had undergone previous abdominal surgery or who had undescended testes (UDT) as part of a suspected disorder of sex development were listed for surgery at RDH.

Patients with impalpable unilateral or bilateral UDT were managed by examination under anaesthesia, with subsequent laparoscopy, fixation of the contralateral testis, single stage laparoscopic orchidopexy or first stage Fowler–Stephens orchidopexy as appropriate. This is the agreed management approach in our tertiary centre and is universally accepted as the gold standard.[5,6] Patients requiring a feeding gastrostomy were managed by laparoscopy assisted insertion of a percutaneous endoscopic gastrostomy (PEG) tube as this technique is the agreed approach in our tertiary centre.

Demographic and clinical details of patients who were listed for or who underwent laparoscopic procedures were obtained from contemporaneous records. Data were compiled using Excel® (Microsoft, Redmond, WA, US).

Results

Over the 11-year study period, 1,339 procedures were performed in RDH as part of the outreach service. Of these, 155 (11.6%) were initially listed for a laparoscopic procedure with 128 (9.6%) eventually undergoing laparoscopy. The median percentage of outreach procedures performed laparoscopically each year was 11.2% (interquartile range [IQR]: 6.7–12.6%).

The indications for laparoscopic surgery (Table 1) were impalpable unilateral or bilateral UDT (*n*=79, 62%) or request for insertion of a feeding gastrostomy (*n*=49 [27 male, 22 female], 38%). Fifty-two patients (41%) were under two years of age at the time of surgery.

There were three UDT cases (4%) with surgical complications (one umbilical wound infection, one testicular atrophy and one haematoma) and one patient (1%) had complications related to the anaesthetic (postoperative apnoea secondary to underlying laryngomalacia, requiring transfer to PICU at our tertiary centre). One gastrostomy case (2%) required transfer to our tertiary centre for management of postoperative urinary retention and iatrogenic urethral injury while being managed on the RDH paediatric ward following surgery.

All cases were performed as day case or short stay procedures. All but six UDT cases (96%) were performed as day surgery. The median length of stay for gastrostomy patients was 3 days (IQR: 2–3 days).

Discussion

Any child undergoing a surgical procedure needs to be treated safely, as close to home as possible and in a suitable environment. Care should be delivered locally when safe but centrally in a specialist tertiary centre when necessary. All those involved in children's surgical services need to be suitably trained and supported, with procedures performed by surgeons with the appropriate competencies in suitable facilities.[8]

Increasing numbers of procedures are being performed in the DGH setting by specialist paediatric surgeons and urologists providing outreach services. The management of impalpable testes (excluding UDT in connection with disorders of sex development)[5,6] benefits from a laparoscopic approach, as may feeding gastrostomies.[7] Laparoscopy assisted PEG tube insertion increases the operative duration and a high number of these procedures must be performed in order to reduce the complication rate.[7] Although these drawbacks have been assessed as worthwhile in our tertiary unit to reduce the risk of serious complications, this is not to imply a universally accepted practice; many surgeons in other tertiary paediatric surgical centres in the UK would not use laparoscopy in all PEG tube insertions.

As laparoscopy is currently not widely provided by paediatric surgery outreach services, this study assessed the laparoscopic service that has been provided for many years to a local DGH by our paediatric surgeons and urologists. A review of the literature did not reveal any previous reports on the provision or effectiveness of such a service.

Our results over 11 years show that there is a significant demand for elective laparoscopic paediatric surgery, with a median of 11% of elective cases performed laparoscopically by our paediatric surgery outreach service in RDH each year. This equates to approximately 12 cases a year but represents only a proportion of the regular exposure to paediatric and laparoscopic (gynaecological and adult) cases performed locally, which maintains the skills of the theatre and anaesthetic staff.

Introducing laparoscopic paediatric surgery (rather than outreach paediatric surgery in general) into a DGH setting involves addressing the potential need for specific new equipment as well as consideration of anaesthetic, paediatric and theatre staff concerns regarding paediatric laparoscopy and risk of complications. Our experience involves anaesthetic staff (including out of hours) comfortable with anaesthetising children and babies under the age of one year as they had already been doing so for the local otorhinolaryngologists. The paediatric surgeon is contactable by telephone and the 15-mile distance from the tertiary unit means that the surgeon is accessible for patient review if necessary.

The paediatric theatre in RDH is located adjacent to the gynaecology suite, and crossover of staff means that they are frequently exposed to the setup and use of laparoscopic

Table 1 Outreach laparoscopic general paediatric surgery procedures performed in a single district general hospital by paediatric surgeons from one tertiary centre between 2004 and 2014

Procedure	*n*	Median age at operation (years)
Laparoscopy assisted insertion of PEG	49	5.17 (IQR: 2.42–11.58)
EUA, laparoscopy, fixation of contralateral testis	41	1.50 (IQR: 1.17–2.25)
Single stage laparoscopic orchidopexy	15	2.17 (IQR: 1.59–5.00)
First stage Fowler–Stephens orchidopexy	11	1.75 (IQR: 1.38–4.46)
Second stage Fowler–Stephens orchidopexy	7	3.75 (IQR: 3.38–9.46)
Other laparoscopy for UDT	5	–

EUA = examination under anaesthesia; IQR = interquartile range; PEG = percutaneous endoscopic gastrostomy; UDT = undescended testes

equipment as well as the use of endoscopic equipment by the otorhinolaryngologists. When introducing the service, one new laparoscopic stack and two instrument sets were purchased. In order to enable theatre staff to become more familiar with this equipment at the outset of the service, simple measures were implemented such as scrubbing early to allow more time to prepare for the case.

These procedures were delivered safely with only a small number of surgical complications and only one child needing transfer to PICU in our tertiary unit postoperatively although the indication for this transfer was not directly related to the procedure. Had the underlying laryngomalacia been diagnosed previously, this case would have been performed at the tertiary centre.

One child developed retention secondary to analgesia. This was a potentially avoidable complication as a lack of familiarity with the appropriate level of analgesia resulted in under-analgesia being followed by over-analgesia. This episode occurred at an early stage of the outreach service; with appropriate analgesic protocols, there have been no subsequent cases of retention. Although patients may be managed in a non-surgical environment in tertiary units, this complication highlights the need for appropriate availability of paediatric, anaesthetic and surgical care when introducing a paediatric laparoscopic service in a DGH. Consideration should therefore be given to the availability of analgesia protocols for the DGH paediatric team (including reversal of opioid side effects) and appropriate training for potentially necessary procedures such as urethral catheterisation.

Over 40% of the laparoscopic procedures were performed on children under 2 years of age, the youngest being 8 months old at the time of surgery. The median ages at which initial procedures for UDT were performed were higher than would be recommended currently by the British Association of Paediatric Urologists.[9] However, this reflects that until recently, the aim has been to perform surgery at approximately 12 months of age. It is therefore a consequence of what was considered an appropriate referral age (from general practitioners and local general surgeons) between 2004 and 2011.

Safe treatment in a DGH means that services are delivered in an appropriate way by a specialist team, avoiding unnecessary secondary care admissions to a tertiary centre, and potentially avoiding inappropriate investigations and operations. For example, local practice had been to request ultrasonography and consider groin exploration for impalpable UDT whereas this is not the practice in our tertiary unit.

Key prerequisites for the introduction of laparoscopic paediatric surgery cases to a DGH in an outreach manner are that conditions and staff in the DGH have been set up appropriately to enable a safe and effective system. These include provision for preoperative assessment, anaesthesia, postoperative recovery and a paediatric day case unit. Once such a system has been established and has been shown to work in a safe manner, expansion of the service can be considered. In our experience, this has been made possible by increased availability of operating lists and the joint appointment by the hospitals involved of new paediatric surgical consultants. This has enabled provision of an on-call service allowing emergency laparoscopic appendicectomies to be performed locally on younger children who would previously have required transfer to the tertiary unit.

Conclusions

The findings of this study suggest that elective laparoscopic procedures in children of all ages can be provided safely as components of an outreach service in a DGH setting as part of an increasing volume of operations performed by specialist paediatric surgeons. This enables children to have a high quality service as close to their home as possible.

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