Laparoscopic suture-less herniotomy using tissue-sealing device for paediatric hydrocele

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INTRODUCTION

Hydrocele in children is due to patent processus vaginalis (PPV) and laparoscopic herniotomy (LH) is a preferred approach for its management.\(^1\) LH in children is usually performed through three ports involving intraperitoneal suturing. The suturing of the sac in LH increases duration of operation, induces foreign body reaction, predisposes to vasal kink and vascular obliteration, has the potential for bowel adhesions and makes it prone to slippage of suture leading to recurrence, which has prompted the researchers to look for better ways of dealing with the sac.\(^2\) The suture-less repair has been described by few authors to overcome suturing-related issues.\(^3,4\) Vessel sealing technology is powered by energy platform controlled by tissue sensing technology, which uses the body’s own collagen and elastin to create a permanent zone of closure. This technology has been used to seal vessels up to 7 mm, lymphatics, tissue bundles, small lumen organs and pulmonary vasculature.\(^5-7\) We present our experience...
of using tissue-sealing device to achieve suture-less closure of internal ring in LH for the treatment of paediatric hydrocele.

MATERIALS AND METHODS

A prospective observational study was carried out in Pediatric Surgery Unit between March 2014 and September 2016. The study included all patients presenting with hydrocele after 1 year of age or infantile hydrocele persisting beyond 1 year age. All complicated hydrocele cases (e.g., pyocele and haematocele), hydrocele in children <1 year of age and secondary hydroceles were excluded. Diagnosis of hydrocele was based on clinical examination and was confirmed on ultrasound which also evaluated contralateral disease.

Technique

The children were asked to void urine just before procedure. The surgery was performed under general anaesthesia with endotracheal intubation. With the patient in the supine position, in Trendelenburg position, an approximately 1-cm transverse incision was made above the umbilicus. A pneumoperitoneum of 8–10 mmHg was created using an open approach with a carbon dioxide flow of 1 L/min. Under direct vision, with a 5 mm 30° laparoscope, two 5-mm instruments were inserted using stab technique at the intersection of the horizontal umbilical line and the vertical anterior axillary line. A diagnostic laparoscopy was done to identify the PPV [Figure 1a]. The present surgical technique involves three important steps. First, a small minimum peritoneal incision is made with laparoscopic scissors inferior to PPV to provide space for dissection of vas and spermatic vessels and create a minimal raw area [Figures 1b and 2a]. Second, with blunt dissection, vas and spermatic vessels were pushed far downwards and medially [Figures 1c and 2b]. The PPV is held with a grasper and lifted upwards and laterally away from vas and vessels. Third, with the use of 5 mm vessel sealer from the right working port, the PPV is sealed taking extreme care to keep its blades away from vas and vessels which is easily possible as vas and vessels are already pushed medially [Figures 1d and 2c]. The sealer blade is kept perpendicular to sac to achieve minimum calibre of the sac which would be longer if blades are applied obliquely. As the calibre of hydrocele sac is less, vessel-sealing device can achieve a secure seal and thus avoiding a suture. The tissue-sealing device used for the procedure was Xcellance VesSeal® using cool seal involving calibrated pressure and low power setting of 85 W which leads to melting of tissue collagen and elastin to for a translucent seal. The procedure was completed with fascial closure of umbilical port and skin closure with adhesive glue. Hydrocele fluid was aspirated through scrotum with a fine needle. Postoperatively, feeds were started within 6 h and patients were discharged the same day with oral paracetamol. After the procedure, the patients were followed up by at 1 and 4 weeks, 3 and 6 months and 1 year. The primary endpoint was recurrence, if any, which was evaluated through physical examination.

RESULTS

A total of 21 (28 hydroceles) children underwent the procedure, age ranging from 1 to 14 years (mean age: 4 years). Ten right, 4 left and 7 bilateral hydroceles (2 diagnosed on laparoscopy) were operated. The operative time ranged from 15 to 32 min, with a mean time of 18 min. All patients were discharged after a hospital stay of 12 h. Post-operative follow-up ranged from 2 to 4 years with a mean follow-up of 1.5 years. No recurrences were observed during the follow-up period. One patient had persistent hydrocele for 4 months which resolved spontaneously. There were no intraoperative or post-operative complications.

DISCUSSION

Most accepted advantage of LH is diagnosis and repair of contralateral PPV and bilateral disease with the same incisions.[8] The other advantages of LH include reduced risk of injury to the vas deferens and cord structures due to lesser dissection, low wound infection rate, less pain and better cosmesis.[9] The different techniques of LH
can be divided into two groups, the intracorporeal and the percutaneous approach.\[10\] The success of both of these approaches is based on closing the internal ring by tying a knot. The intracorporeal techniques employ a fully laparoscopic repair to accomplish closure of the vaginal process. They all require the placement of intracorporeal knots (Z type, W type, N type and purse string type) using absorbable or non-absorbable suture, and may result in to iatrogenic peritoneal lesion.\[11-14\] The percutaneous techniques are based on the placement of a circumferential suture around the internal inguinal ring. This suture is tied percutaneously and requires the placement of the laparoscope for its visual confirmation.

Different techniques have been reported on how to place the suture.\[10\] Percutaneous technique does not involve dissection and division of sac and hence it does not qualify to be called a proper herniotomy, which involves dissection, division and ligation of sac. Schier has described the characteristics of recurrence and has found inappropriate suturing as cause of recurrence and has stressed upon meticulous medial suturing to avoid recurrence.\[15\] Suturing predisposes to vasal kink, vascular obliteration and slippage of suture leading to recurrence. This iatrogenically created lesion predispose to foreign body reaction and bowel adhesions.\[14\] The suture-less repair has been described by few authors to overcome suture and suturing-related issues.\[8,9\] The superiority of laparoscopy over open repair in hernia is well reported, but little literature is available on pediatric hydrocele with reference to LH. LH for paediatric hydrocele is found to be superior to open repair by many researchers and has the advantages of selective contralateral repair over negative exploration, reduced scrotal oedema, reduced operating time, reduced wound complications and comparable recurrence.\[1\]

The reliance on vessel-sealing device for occluding luminal structures has led to the use of this energy source for occlusion of vessels of <7 mm calibre, appendix, fallopian tube, etc.\[5-7\] The strength of wound using vessel-sealing device has been studied by biomedical researchers and have found it to be strong enough to rely upon and has found increased strength of seal after the procedure.\[16\] The use of perpendicular seal in the present technique is according to the available literature and provides better burst pressure due to lesser calibre as compared to the application of sealer in oblique manner which increases the effective calibre.\[17\]

The holy trinity of the present technique involves minimal peritoneal incision to avoid iatrogenic lesion, safeguarding of vas and spermatic vessels to avoid any sort of collateral damage and a perpendicular seal to achieve a more secure closure. In the present study, the procedure has been adopted in paediatric hydroceles which are characteristically associated with small-calibre PPV which allows only fluid to enter through it and result in hydrocele unlike hernia which has a wider sac. The small calibre sac allows more secure closure with a sealing device as compared to suturing. The laparoscopic supracervical hysterectomy offers a suture-less LH with avoiding suture and suturing-related complications and reduces operative duration.

In the present study, no recurrence was observed except for one case which has persistent hydrocele for 4 months and resolved spontaneously. Use of sealing device for hernial sac is not recommended by the authors as it has a wider calibre, which would not allow an effective secure closure and should be handled with laparoscopic or percutaneous techniques.

**CONCLUSION**

Laparoscopic suture-less herniotomy provides an easy, secure and safe procedure for paediatric hydrocele utilising best of advancement in the field of surgical technology and technique.
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Conflicts of interest
There are no conflicts of interest.

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