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Intravenous methylene blue venography during laparoscopic paediatric varicocelectomy

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ABSTRACT

Introduction: One of the challenges of varicocele surgery is to prevent hydrocele formation while still ensuring success. Methylene blue has been used to identify and preserve lymphatic vessels, and venography has been a standard component of sclerotherapy and percutaneous retrograde techniques. The authors have combined both approaches during laparoscopic varicocelectomy and report their experience.

Methods: A prospective study was performed of adolescents with idiopathic varicocele and spontaneous venous reflux on Doppler ultrasound. A pampiniform plexus vein was cannulated via scrotal incision before creating the pneumoperitoneum. A mixture of methylene blue and Omnipaque™ was injected into the pampiniform plexus with fluoroscopic screening. Laparoscopic selective vein ligation was then performed using 5 mm endoscopic clips or a bipolar vessel sealing device such as Plasmakinetic™ or Ligasure™. Venography was repeated to confirm complete ligation of the internal testicular veins. Patients were followed-up at 3, 6, and 9 months post-surgery with clinical examination and Doppler ultrasound. Data are presented as median (interquartile range).

Results: Twenty-four patients underwent laparoscopic selective vein ligation with venography and methylene blue injection. The median age was 14.7 (14.6–15.7) years. The recurrence rate was 12%. No patients developed a hydrocele. The length of surgery was 120 (100–126) minutes.

Conclusion: Intra-operative intra-venous methylene blue injection and venography helps to identify venous duplications of the internal testicular veins and enhances the success rate of laparoscopic selective vein ligation. This approach prevents hydrocele formation but has a 12% recurrence rate, which appears to be higher than some techniques described in the literature.

Scrotal varicoceles are relatively common in adolescent boys and there have been many techniques described in the literature to treat them [1]. The aim of such surgery is to achieve complete ligation of incompetent veins, preservation of fertility, resolution of pain, restoration of symmetrical testicular volumes while limiting damage to surrounding lymphatic and arterial structures. The anatomy of testicular venous drainage is complicated [2] and recurrence caused by a persistence of collateral veins can be problematic [3]. There is an on-going debate about the merits of lymphatic and artery sparing surgery in reducing hydrocele formation or recurrence [4].

Venography is a standard component of sclerotherapy [5] and percutaneous retrograde techniques [6]. In the majority of recurrences a residual incompetent internal testicular vein is demonstrated by venography [8]. In our practice antegrade venography of the pampiniform plexus identifies a higher incidence (>80%) of anatomical variations compared to 26–65% using retrograde techniques [7,9]. Pre-operative venography has been described to identify the optimum level for varicocelectomy [10]. Intra-operative venography can identify collateral veins [3] however its reliability has been questioned [11].

Methylene blue can identify and preserve lymphatic vessels which may reduce the incidence of hydrocele formation [12–14]. However intra-parenchymal injection can result in testicular loss [13] and injection around the tunica vaginalis may not reliably stain the lymphatic vessels. Methylene blue is only licenced for use intravenously and is excreted in the urine. It has been used intra-operatively during varicocelectomy to identify the veins during an open inguinal approach [15]. To date it has not been described in combination with laparoscopic selective vein ligation. Our aim was to investigate whether combining intravenous contrast with methylene blue could enhance the ability to detect the small residual collateral veins and therefore reduce recurrence and limit complications.

1. Methods

A prospective study was performed of adolescent patients with an idiopathic varicocele and spontaneous venous reflux on Doppler ultrasound. All patients included had a palpable (grade II) or visible (grade III) varicocele on clinical examination using the Dubin and Amelar clinical classification [16]. Doppler ultrasound was performed

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with 5–10 MHz probes with the patient stood upright and spontaneous breathing. The Hirsh classification was used to classify Doppler grade [17]. Puberty was classified as pre-pubertal (absent pubic hair with infantile genitalia) and pubertal (complete development of pubic hair and genitalia).

Indications for surgery included pain [18], testicular volume asymmetry [19,20] and randomisation to early surgery as part of a clinical trial of asymptomatic patients currently running in our hospital REC09/H1013/15 [21]. All asymptomatic patients were part of this trial. The ethical approval obtained for the study was based on using the surgical technique described in this paper. Testicular asymmetry was defined as a difference in testicular volume >20% as measured by testicular ultrasound [20].

Procedure

A pampiniform plexus vein was cannulated via a scrotal incision using the method described by Tauber [22]. A mixture of 4 ml 1% methylene blue and 40 ml 300 mg/ml Omnipaque™ (iohexol) was injected into the pampiniform plexus vein and position confirmed with fluoroscopic screening (Fig. 1). Pneumoperitoneum was created and laparoscopic selective vein ligation was then performed (Fig. 2 A, B,C). The veins were ligated with 5 mm endoscopic clips or using a bipolar vessel sealing device such as Plasmakinetic™ or Ligasure™. Blue venography was repeated to confirm complete ligation of the internal testicular veins (Fig. 3) with careful inspection both radiological screening and direct laparoscopic visualisation to identify any residual veins.

Patients were seen in clinic at 3, 6 and 12 months post-surgery with clinical examination and Doppler ultrasound. Data are presented as median (interquartile range).

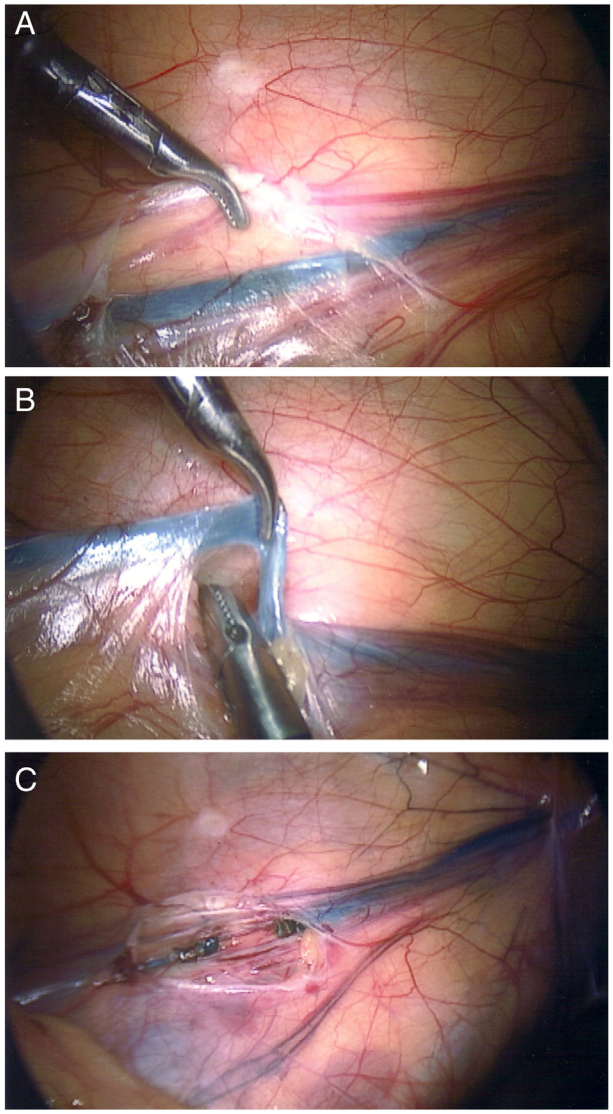

Fig. 2. A. Internal testicular vein stained with methylene blue. B. Selective dissection of internal testicular vein. C. Ablation and division of internal testicular vein with bipolar vessel sealing device.

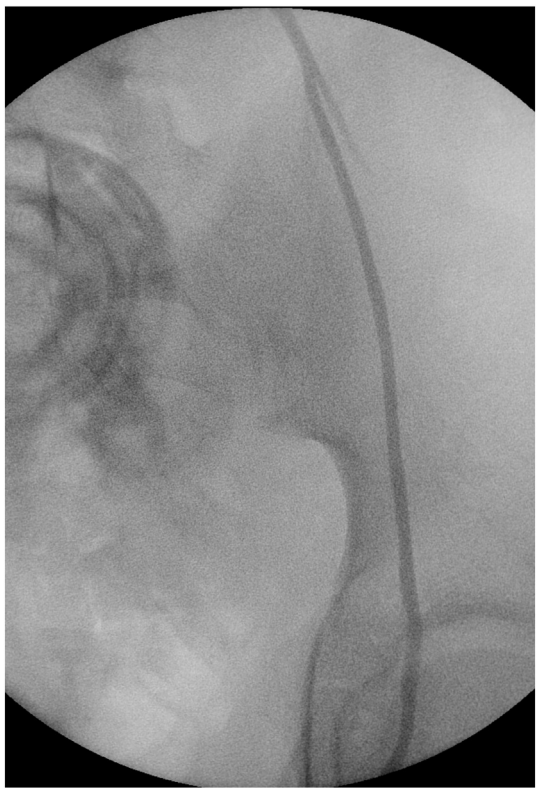

Fig. 1. Antegrade venography to confirm parallel duplication of the internal testicular vein.

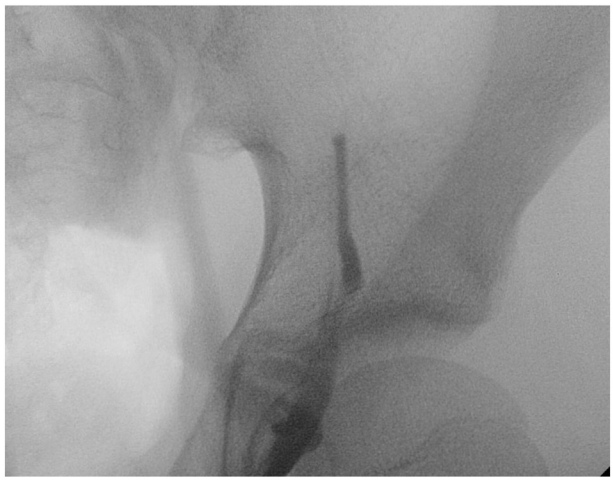

Fig. 3. Venogram post-ligation of internal testicular vein.