Do Infants and Children have Measurable Inguinal Canals?

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Introduction

Herniotomy remains one of the most frequently performed surgical procedures in childhood¹. However, opinions differ as to whether to open the inguinal canal while performing the procedure as proposed by Ferguson and Gross², or not to open it as proposed by Mitchell Banks. The reason for the latter procedure being the superimposition of the superficial ring on the deep ring sometime during childhood³. This prospective study was aimed at corroborating or refuting this hypothesis.

Materials and Methods

From October 2007 to September 2008, and from May 2012 to April 2013, children up to two years of age with a diagnosis of communicating hydroceles, inguinal hernias, encysted hydroceles of the cords, and truly descended testes were operated on by two Consultant Paediatric Surgeons in our unit. Under general anaesthesia with the child in the supine position, the abdomen was cleansed and draped. A skin crease inguinal incision was made, the medial end of incision just supero-lateral to the pubic tubercle, the incision was deepened through the Camper’s fascia and the Scarpa’s fascia to expose the external oblique aponeurosis which was opened along its fibres to open the inguinal canal. The lateral flap was elevated, taking care to identify and protect the underlying delicate ilioinguinal nerve. The pubic tubercle was palpated at the infero-medial end of the inguinal canal, the inferior epigastric vessels were identified supero-medial to the deep inguinal ring, using a sterilized metallic ruler (Fig 1), and the distance between the two structures was measured in centimeters. A herniotomy with a high ligation of the sac using a non-absorbable suture at the level of the inferior epigastric vessels, was done to complete the process. The wound was closed in layers.

How to cite this article?


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Fig. 1: Shows the inguinal canal of a 1 year old male child with an inguinoscrotal hernia

Results

Seventy six inguinal canals were measured in 72 males and 3 females, 1 male (1.3%) had bilateral inguinal hernias. Seventeen (22.6%) had right inguinoscrotal hernias, 7 (9.3%) had left communicating hydroceles, another 7 (9.3%) had left inguinoscrotal hernia, 16 (21.3%) had left inguinal hernia, 2 (2.6%) had left undescended testes, 1 (1.3%) had a left vaginal hydrocele, 2 (2.6%) had a right communicating hydroceles, 20 (26.6%) had right inguinal hernias, and 3 (4%) had right undescended testes. The lengths of the inguinal canals ranged from 1cm to 4.5 cm (mean 2.88cm+/-.71cm SD). The shortest inguinal canal length was 1 cm in a 2 months old male child who had a right inguinoscrotal hernia, while the longest inguinal canal was 4.5 cm and belonged to a 7 months old male child that had a left inguinoscrotal hernia (see Fig 2).

Discussion

The anatomy of the undisturbed canal has the following features:

(i) The pubic tubercle is the attachment of the lateral limb of the superficial (external) inguinal ring (the medial limb fuses with the anterior rectus sheath).

(ii) The midpoint of the inguinal ligament (the midway between its origin in the anterior superior iliac spine and its insertion in the pubic tubercle) is the standard surface marking of where the external iliac artery gives off its last branch in the abdomen, passes behind the inguinal ligament, and becomes the femoral artery.

(iii) This last branch is the inferior epigastric artery and it runs supero-medially just deep to the tranversalis fascia to form the medial limit of the deep (internal) inguinal ring, and the lateral border of the Hesselbach’s triangle in its upward course to enter the rectus sheath lying between the rectus muscle and the posterior rectus sheath4,5,6,7.

(iv) Against the background of these anatomical considerations, it is obvious that the inguinal canal extending from the deep inguinal ring to the external inguinal ring has a definable, and a definite length that relates to the medial half of the inguinal ligament.
Herniotomies are commonly done by Paediatric Surgeons, two approaches are used; the Ladd and Gross procedure, and the Mitchell-Banks procedure, although laparoscopic herniotomy has come into the picture. The former method, which we used, entails making an inguinal incision which is deepened by incising the Camper’s and Scarpa’s fasciae to expose the external oblique aponeurosis, which is incised along its fibres to open the inguinal canal, the ilioinguinal nerve is seen and avoided, the cremasteric fascia is incised, to expose the vas, its blood supply, and the hernia sac. The sac is separated from the vas and its blood supply, with further dissection, the sac is mobilized to the level of the preperitonial fat and ligated with non-absorbable sutures. The wound is closed in layers. In Mitchell-Banks method, an inguinal incision is made, two cm long sited over the supercilious inguinal ring. The incision is deepened by layers sequentially: Camper’s fascia, Scarpa’s fascia, the spermatic cord is identified as it emerges from the superficial ring, distal to the ring, the cord is covered by external spermatic fascia and cremasteric fascia. These must be split, and this separates the vas deferens and vessels from the sac. The sac is pulled as much as possible, gently, out of the inguinal canal through the supercical ring. It is ensured that the sac is empty and is ligated as proximally as possible with absorbable sutures. The wound is closed in layers.

The controversy has continued over which procedure to adopt when performing childhood herniotomies. K Ravi and DB Hamer did a study in which they surveyed the surgical treatment of inguinal hernias in children in the United Kingdom, and came up with the conclusion that there was obviously no standard surgical technique for inguinal herniotomy in children, and there were only trends. In children under the age of two years, most surgeons surveyed performed the operation superficial to the external ring, although a higher proportion of surgeons at specialist units opened the inguinal canal routinely. In a similar article, Sklar C, and Cameron BH, noted that most American Surgeons opened the inguinal canal, others preferred the Mitchell-Banks method, and advised the opening of the inguinal canal to effect the high ligation of the sac to prevent recurrence.

In our paediatric surgical unit, we decided to put the issue finally to rest by physically measuring the distance between the pubic tubercle and the inferior epigastric artery, after carefully developing our inguinal incision by sharp dissection from skin, through the Camper’s fascia, Scarpa’s fascia, and incising the external oblique aponeurosis, avoiding undue traction or retraction at this stage.

It is true that one may get away with doing herniotomy without incising the external oblique aponeurosis to open the inguinal canal during childhood herniotomies. This is achieved by exerting considerable traction on the hernia sac. Quite often, the protagonists of this method do not insist on viewing the inferior epigastric vessels which we did in all the cases studied, (may be absent in a malnourished child), and therefore leave behind a short sleeve of hernia sac proximal to the point of herniotomy- a recipe for recurrence.

Indeed another good reason for exposing and identifying the internal ring is that, especially in relatively large herniae, the canal may become so long, and the deep inguinal ring so large as seen in one of our patients as to readily admit an examining finger after the hernia sac had been transfixed and excised. That defect could be easily repaired by narrowing the ring.

Another pitfall sometimes encountered by those who limit their dissection to the area of the superficial ring without opening the external oblique aponeurosis is that when they do not readily find the hernia sac, and in the mistaken basic belief that the deep ring is just deep to the superficial ring, they plough deeper through the conjoint tendon and encounter the distended urinary bladder which they mistake for “an unusually thick hernia sac”.

**Conclusion**

We conclude that children have well defined, definite, and measurable inguinal canals and these should be routinely opened during herniotomies.

**Acknowledgements:** None

**Funding:** None

**Conflict of interest:** None

**Permission from IRB:** Yes

**References**


