Cryptorchidism and the value of ultrasonography

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ABSTRACT

INTRODUCTION The aim of this study was to evaluate the usefulness and accuracy of ultrasonography in investigating cryptorchidism.

METHODS Case notes were reviewed of all children with cryptorchidism who had undergone ultrasonography for their testes between February and October 2010. Preoperative ultrasonography findings for presence or absence and position of testes were noted and compared with the operative findings. The sensitivity and specificity of ultrasonography were calculated.

RESULTS A total of 50 testes in 42 boys were examined by ultrasonography preoperatively during the study period. The median age was 6 years. All had single B-mode greyscale ultrasonography using greyscale and Doppler imaging. Of the 50 testes, 42 were visualised intracanalicularly or in the superficial inguinal pouch, 2 were intra-abdominal and 6 could not be detected. However, on examination under anaesthesia, 37 out of the 50 testes were palpable in the groin and 13 were impalpable. Two out of the remaining thirteen were found to be atrophic on diagnostic laparoscopy. The sensitivity and specificity of ultrasonography in determining the presence of testes was 85% and 25% respectively.

CONCLUSIONS Ultrasonography has low sensitivity and specificity in determining the presence of testes and localisation of their position. When performing an examination under anaesthesia and using a laparoscopic technique, ultrasonography is not recommended in cases of cryptorchidism.

KEYWORDS

Undescended testes – Ultrasonography – Children

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Cryptorchidism is the absence of one or both testes from the scrotum and it is the most common genitourinary anomaly in boys.¹ It is recorded in 30% of preterm infants compared with 3% of term infants.² Initial diagnosis and referral of boys with suspected undescended testes (UDT) or empty scrotum is usually made by neonatologists, general practitioners, health visitors or paediatricians. Detailed physical examination by a paediatric surgeon is important to determine the presence and position of the testes.

UDT could be present at any point along the path of normal testicular descent from the retroperitoneum adjacent to the kidneys down to the ipsilateral hemiscrotum. On the other hand, ectopic testes could be present outside this normal path (eg superficial inguinal pouch, root of penis, perineum and upper part of thigh or even contralateral hemiscrotum). In 70% of cryptorchidism cases, the testes are clinically palpable. The rest could be either absent or vanished, located intra-abdominally or in the inguinal canal. Occasionally, although palpable, testes may not be identified on physical examination in an uncooperative or obese child if the testis is very small or in a scarred groin from previous operations. Precise localisation of these testes prior to surgery is crucial in surgical decision making.³

Some clinicians use diagnostic imaging modalities (eg ultrasonography, magnetic resonance imaging [MRI] or computed tomography [CT]) to localise undescended or impalpable testes. The benefits of such investigations should be weighed against irradiation risks, costs and burdens on the healthcare system, including the need of general anaesthesia in some of these cases. However, owing to its easy availability and non-invasiveness, ultrasonography is the most widely used imaging modality to evaluate boys with cryptorchidism prior to paediatric surgical consultation.⁴ The aim of this study was to evaluate the usefulness and accuracy of ultrasonography in investigating cryptorchidism.

Methods

All children with cryptorchidism who had undergone ultrasonography for their testes between February and October 2010 in a paediatric tertiary referral hospital were included in this study. Case notes were reviewed, and demographic details, radiological impression and operative findings were recorded. Preoperative ultrasonography findings for presence or absence and position of testes were compared with the operative findings. The data were analysed, and the sensitivity and specificity of ultrasonography were calculated.

Figure 1 Ultrasonography showing testicular tissue within the inguinal area in a boy with undescended testis

Results

Overall, 50 testes in 42 boys underwent preoperative ultrasonography between February and October 2010. Of these, 34 were unilaterally undescended or impalpable and 16 were bilateral. None of these testes were retractile in this group. The median age at operation was 6 years. Ultrasonography was carried out by a consultant radiologist or a senior radiology trainee under supervision in a paediatric tertiary centre. All had single B-mode ultrasonography using greyscale and Doppler imaging (Fig 1). The ultrasonography findings are summarised in Table 1.

All 42 boys (50 testes) had an examination under anaesthesia prior to a surgical procedure under the same anaesthetic. Thirty-seven of the fifty testes were palpable and underwent a single stage orchidopexy. The remaining impalpable testes underwent a diagnostic laparoscopy (Fig 2). Two of these thirteen testes were found to be atrophic and were therefore excised. The rest underwent a staged orchidopexy. Ultrasonography findings were compared with the operative findings (Table 1). Both sensitivity and

Figure 2 Laparoscopic view of a patient who underwent diagnostic laparoscopy (30° scope) as a treatment for impalpable undescended testes. Viable testis located close to the internal inguinal ring.

specificity were calculated according to the total positive values (48), the total negative values (2), the false positive values (6) and the false negative values (8). The sensitivity and specificity of ultrasonography in determining the presence of testes was 85% and 25% respectively (Table 2).

Discussion

Since the first report of ultrasonography evaluation of impalpable testes published in the 1970s,⁵ several subsequent studies have been conducted regarding ultrasonography performance. Over the last few decades, ultrasonography technology has advanced with newer transducers having a greater resolution power to distinguish testes from adjacent tissues.⁶ Kullendorff *et al* found that ultrasonography identified 93% of palpable UDT cases detected by physical examination. However, in the same

Table 1 Comparison of ultrasonography and operative findings

	Ultrasonography	Operative
Not visible or absent	6 (12%)	0 (0%)
Small sized, atrophic looking	0 (0%)	2 (4%)
Intra-abdominal	2 (4%)	11 (22%)
Extra-abdominal (intracanalicular / superficial inguinal pouch)	42 (84%)	37 (74%)

Table 2 Ultrasonography sensitivity and specificity in cryptorchidism

	Sensitivity	Specificity	Positive predictive value	Negative predictive value
Presence of testicular tissue	85%	25%	88%	20%

series, only 87% of these were correctly localised using 5MHz and 7.5MHz transducers,⁷ compared with 70% reported by Weiss *et al.*⁸ Nijs *et al* stated that ultrasonography failed to identify 14 out of 33 viable intra-abdominal testes despite the advanced technology and the use of 5–12MHz and 7–10MHz transducers.⁹ It seems the recent advances in ultrasonography technology do not warrant a better testicular identification outcome, particularly in intra-abdominal cases.

The surgical approach for boys with cryptorchidism depends on the presence or absence of testes at the time of examination under anaesthesia prior to the surgical procedure. Single stage open orchidopexy is usually performed for palpable testes using the groin or scrotal approach. On the other hand, an initial diagnostic laparoscopy is performed for impalpable testes in most cases. This is usually followed by a or multistage orchidopexy if a good sized testis is identified using either a laparoscopic or an open approach. Conversely, if an atrophic looking testis or nubbin is encountered, an orchiectomy with or without fixation of the contralateral testis is generally performed.¹⁰

In his series, Elder reported that ultrasonography identified 12 of 45 (26.6%) palpable UDT cases.¹¹ It appears that, at best, ultrasonography adds little to the physical examination and, at worst, provides misleading information.⁴ Kullendorff *et al* stated that ultrasonography located 33% of impalpable testes correctly in the groin and none of them were intra-abdominal.⁷ On the other hand, Elder found that ultrasonography was negative in all impalpable testes.¹¹ All these testes were either intra-abdominal or atrophic nubbins on surgical exploration. Ultrasonography can therefore potentially identify impalpable testes in the groin but not when present intra-abdominally.⁴

Current European Association of Urology guidelines state that ultrasonography, CT and MRI do not provide any additional information to the physical examination of palpable testes.¹² According to a meta-analysis and systematic review by Tasian and Copp, the sensitivity and specificity of ultrasonography in identifying impalpable testes was 45% and 78% respectively.¹³ However, in the current series, the sensitivity and specificity of ultrasonography in determining the presence of testes was 85% and 25% respectively, and 84% of testes were located by ultrasonography as extracanalicular despite the fact that only 74% were found to be extracanalicular during open surgery. Consequently, 10% could have been missed during the groin exploration, requiring unplanned extensive surgical dissection, compromising the testes.

Preoperative ultrasonography is not reliable in localising impalpable UDT and it is not useful in determining subsequent surgical management.⁴ Nevertheless, imaging is considered a helpful diagnostic tool in certain clinical situations (eg disorders of sexual development and hypospadias or the investigation of internal genitourinary organs).¹⁴

Conclusions

Ultrasonography has low sensitivity and specificity in determining the presence of testes. When performing an examination under anaesthesia and using a laparoscopic approach, ultrasonography is not recommended in the routine evaluation of boys with cryptorchidism.

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