UNDESCENDED TESTIS: EVALUATION BY MAGNETIC RESONANCE IMAGING

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ABSTRACT

We describe our experience of prospective magnetic reasonance imaging (MRI) study in patients of undescended testis, with a 1.5 T equipment using body coil. There were thirty two patients, aged 1.5 to 14 years with a mean age of nine years. Surgical follow up was obtained for thirty one patients. We were able to indicate the position of 26 testes in 22 patients and absence of five testes in three patients. MRI was falsely positive and negative for five and two testes, respectively. Testicular tissue at ectopic site was identified by presence of characteristic signal intensity pattern, mediastinum testis and its location along empty spermatic canal in cases of inguinal testis either singly or in combination. MRI was able to detect atrophic changes in four testes, confirmed on surgery. The study concludes that MR imaging is useful in the localization and tissue characterization of a non palpable testis. However, it is not sensitive enough for complete exclusion of the diagnosis of an undescended testis. Thus a surgical or laproscopic exploration may be needed further in selective cases for the management of patient.

Key words: *Undescended testis, Atrophic testis, Magnetic reasonace imaging.*

Cryptorchidism is a common disorder of sexual differentiation in young and adult individuals. It has an incidence of 2.7 to 6% at full term and 0.8% at one year of age. Spontaneous descent is unlikely after one year(1). An undescended testis may be either intra abdominal, intra canalicular, ectopic or congenitally absent. It possesses a high risk of malignancy and impaired spermatogenic function in the undescended as well as contralateral undescended testis(1). Therefore an adequate preoperative assessment and localization of undescended testis is imperative for further surgical and clinical management of patients. Multiple diagnostic modalities such as ultrasound(2,3), computed tomography(4,5), arteriography(6), spermatic venography(7) and laproscopy(8) have been used to localize cryptorchid testis. However, these modalities are associated with disadvantages such as operator dependence, technical difficulties, invasiveness, poor sensitivity and specificity and exposure to ionizing radiation. There have been various studies stressing the role of MRI in undescended testes with encouraging results(1,8-11). In this communication, we report our experience regarding diagnostic utility of MRI prospectively in thirty two patients with unilateral and bilateral undescended testis. The MRI findings were followed up surgically and clinically.

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Received for publication September 20, 1991; Accepted January 16, 1992

Subjects and Methods

Thirty two patients (24 unilateral and eight bilateral undescended testes) underwent MRI examination at our Center from January 1990 to July, 1991. Their ages ranged from 1.5 to 14 years with a mean age of 9 years. The patients were followed up surgically (n = 31) and clinically (n = 1).

The MR scans were performed on a 1.5 T superconducting magnet, MAGNETOM (Siemens, Germany) using a body coil. An axial scout image just below umbilicus was followed up by coronal and axial T1 and T2 weighted images (TR 500/700 msecs, TE 20/22 msecs and TR 2000 msecs, TE 20/90 msecs). Coronal sections of 5 mm with no interslice gap were placed on a axial scout image covering the anterior to posterior aspect of abdomen. Thus abdomen from renal area above to scrotal region below was fully examined. Axial images of 5 mm were taken with 0.5 to 1 mm of inter slice gap covering the suspected area of interest, as seen on coronal images. In most cases they were confined to lower abdomen and pelvis. Children below five years were sedated with chloral hydrate and adequately immobilized. Computed tomography and ultrasound studies were available in only 7 and 5 cases, respectively.

Results

Magnetic resonance imaging (MRI) showed 31 abnormally placed testes in 27 patients comprising of 23 unilateral and 4 bilateral undescended testes. These ectopic testes were seen in inguinal (n = 24) and intra abdominal (n = 7) locations. In one patient aged 9 years, testicular tissue could not be identified anywhere along the path of descent or at any ectopic site. However, scrotal sac revealed suspicious testicular tissue on MRI. In the remaining 4 patients, no testicular tissue was seen. The testicular tissue was identified by presence of characteristic signal intensity pattern, mediastinum testis and its location along empty spermatic canal in cases of inguinal testis, either singly or in combination.

MR imaging of 27 undescended testes demonstrated, signal intensity characteristic identical to those of scrotal testes, *i.e.,* hypointense to fat on T1-weighted and hyperintense or isointense to fat on T2-weighted sequences. However, 6 testes showed hypointensity in T1-weighted and mild hyperintensity less than fat on T2-weighted sequences thus depicting underlying fibrotic changes. Surgical follow up of 4 testes confirmed our suspicion. One patient with bilateral undescended testis lying in scrotal sac showing atrophic changes is being followed up clinically. In coronal images, all the inguinal testes were located along the course and medical border of a linear low signal intensity structure, which extended up to scrotal sac. Most likely it represents fibrostic gubernaculum. Mediastinum testis was seen in only 7 out of 24 testes on T2-weighted images and none in seven intra abdominal testes. The contents of spermatic cord were seen in 10 inguinal testes near internal inguinal ring and could be followed to the undescended testis.

Twenty six testes were correctly identified on surigcal exploration out of thirty one as shown by MRI. There were 5 false positives on MRI. They were diagnosed as undescended testes in inguinal (n = 2) and intra abdominal (n = 3) regions. The two cases of undescended testes in inguinal region were lymph nodes on surgery. Retrospective evaluation of MRI study in these 2 cases showed that MR images were not typical of testes. It showed hypointensity to fat on T2-weighted images. They did

not possess hypointense rig of tunica albuginea and they were located lateral to cord. The other three cases were most probably bowel loops as surgical exploration was negative for testes. However, it showed testicular intensity pattern on both T1 and T2-weighted sequences and no continuity with bowel loops on retrospective evaluation. In four patients comprising one unilateral and three bilateral undescended testes MRI examination was negative. Surgery revealed bilateral intra abdominal testes in one patient. MRI was truely negative for 5 testes out of 7. Thus there were a total of 28 testes on surgical exploration in both MRI positive and MRI negative patients. They were either intra abdominal in 21.5% (n = 6), inguinal or intra canalicular in 64.5% (n = 18) and atrophic in 14% of cases (n = 4). Out of 18 inracanalicular testes, 10 were in subcutaneous space anterior to external inguinal ring and eight in inguinal canal. One testis in later group located near external inguinal ring was atrophic.

In our series, MR sensitivity for localization of clinically non palpable testes was 84% (26 out of 31). Specificity for testicular absence was 71% (5 out of 7) and for atrophic changes 100% (4 out 4). Testicular absence in our series was 26.3% (10 out of 38). CT was positive in only 3 patients out of 7 and ultrasound study in 2 out of 5 patients. MRI showed 2 and 1 testes each on CT and ultrasound negative patients. However, they confirmed all cases of undescended testes as shown by CT and ultrasound.

Discussion

The undescended testes are more prone for malignant changes and they loose reproductive function in an adult. Intra abdominal testes have greater predilection for malignant changes as compared to inguinal one. Several workers have reported significant histological changes in cryptorchid testes by two years of age(8). It has a prevalence of 0.8% at one year of age and spontaneous descent is unlikely after first year. Keeping in view of this, an early orchiopexy between one and two years of age has been advocated for preservation of fertility(1,9). It further allows improved surveillance of testes in due course of time. The over all accuracy of MRI in our prospective series was 84% (26 out of 31) as compared to 93 to 94% by previously published reports (1,9-11). The specificity for testicular absence in our series was 71% as compared to 86% prospectively and 100% retrospectively as reported by Kier *et al.*(9). In the above mentioned series, the average patient age was more than 20 years except in series of Kier *et al.*(9). where patients upto 6 years of age were studied.

Ultrasound and CT have both been successful for localization of undescended testes and these studies suggest that MR has no higher sensitivity and specificity as compared to them. Lee *et al.*(4) successfully demonstrated 7 undescended testes with CT comprising the patients aged 9 to 38 years. Wolverson *et al.*(5) reported a sensitivity of 94% with CT, 88% with ultrasound and 100% specificity with both modalities in a study group comprising patients more than five years of age. In our series there were six intra-abdominal testes (21.5%) on surgery. MRI was false positive for three and false negative for two cases of intraabdominal testes. In false negative cases one was located posterolateral to urinary bladder and second was near aortic bifurcation. Intra–abdominal testes located near or at the internal inguinal ring are easily evaluated by MRI (*Figs. Ia & Ib*). The assessment of spermatic cord and tes-

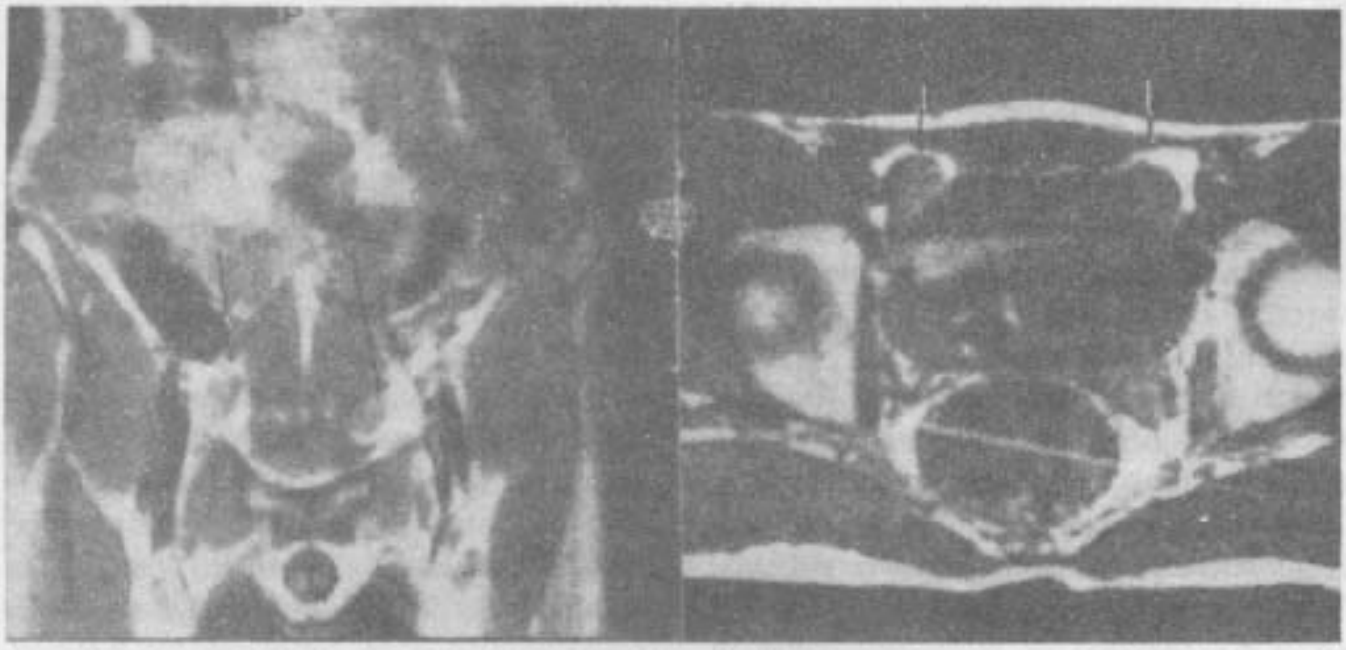

Fig. 1A & B. T1-weighted (SE TE/TR 20/700 m secs). Coronal and axial images show bilateral undescended testes located near internal inguinal rings adjacent to urinary bladder.

tes together is essential for proper diagnosis. An empty spermatic canal is visible on MRI as a thin line extending from inguinal canal to base of scrotum. It most likely represents thin fibrotic gubernaculum. An empty spermatic canal must be differentiated from atrophic cord. The latter has significant width but is thinner than contralateral cord. An empty spermatic canal or absent cord suggest possibility of intra-abdominal testes. However, the presence of cord structures in the canal does not exclude the possibility(1). In our series of 6 intra-abdominal testes, only three showed an empty spermatic canal. The mediastinum testis when visualized as a low signal intensity band within testis, provides improved specificity of the diagnosis(9). In this study only 7 testes showed this finding,which had a 100% specificity. The intracanalicular or inguinal testes are easily identified on MRI, since these are contrasted with fat (*Fig. 2a & 2b*). In majority of patients the testes are usually void in shape with clear demonstration of tunica albuginea. They are usually seen with their epididymis and intra-vaginal fluid in many cases. In this series, there were 6 testes which showed hypointensity on both T1 and T2-weighted images in addition to its smaller size; out of which 4 testes on surgical exploration proved to be atrophic in nature. This suggest that MR imaging may be of value in tissue characterization. Fritzsche *et al.*(10) demonstrated similar findings on MRI in two patients of atrophic testes confirmed on surgery. Mattrey *et al.*(1) have reported 9 cases of surgically proved testicular atrophy in their series. It is usually seen as atrophic cord reaching the base of empty scrotum and is related to missed extra-vaginal torsion. These cases do not require surgical resection. In our series, there was one such patient aged nine years with bilateral undescended testis. MRI did not reveal testicular tissue

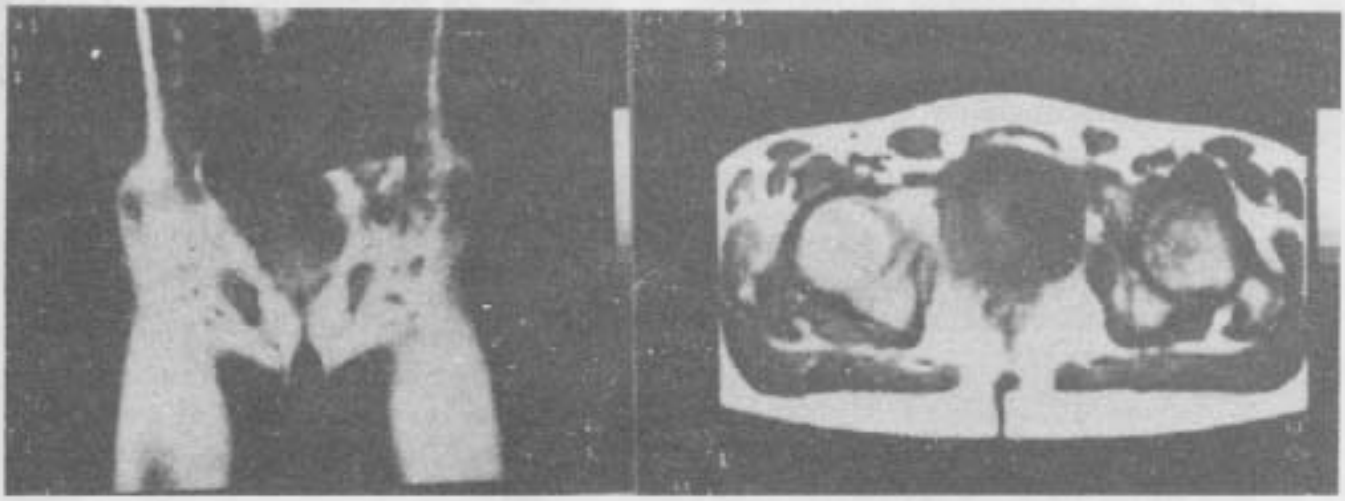

Fig. 2A & B. T1-weighted (SE/TR/20/500 m secs). Coronal and axial images show a bilateral undescended testes located in subcutaneous space anterior to external inguinal rings. Testes is seen bilaterally as an ovoid structure. A linear hypointense structure is gubernaculum testis is seen from lower end of testis to scrotal sac bilaterally.

any where along the path of descent. However, atrophic cord could be traced to scrotal sacs associated with hypointense tissue within the scrotal sac bilaterally in both T1 and T2-weighted sequences. Testicular absence in our series was 26.3%. A recent surgical series, reviewing cases of impalpable testes reported an incidence of 28 to 64%(13,14). The undescended testes in our series were well imaged with MR in both trans axial and coronal images. AT 1.5 T adequate contrast was seen in both short and long TR/TE sequences. In majority of cases, a short and long TR/TE sequence in coronal and axial planes were enough to conclude a diagnosis. Surgical exploration is widely practised by surgeons all over the world due to unreliability of imaging techniques. However, the trend may change with improved sensitivity and specificity by MRI in due course of time. Endocrine tests are helpful in cases of bilaterally impalpable testes, which are congenitally absent. They are of no use in unilateral case or in patients more than 35 years of age(11).

In summary our findings in this series suggest that MR imaging may be the most accurate non invasive tool for localization of undescended testes. It has the capability to show superficial as well as deep structures with ease. The utility of modality is enhanced for this radio-sensitive organ as it is non ionizing. The clinical management may further be improved due to its capability of tissue characterization. However, MR is not currently accurate enough to enable complete exclusion of an undescended testis. The efficacy of MR may further be improved by application of new faster sequences and development of gastrointestinal contrast media.

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NOTES AND NEWS

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