Undescended testis (UDT) is a relatively simpler pediatric surgical problem. But, certain grey areas still persist in the management of UDT. Pediatric surgeons have agreed to disagree on many topics - from clinical findings to proposed multi-centric study (MCS). Following is the summary of the discussion.

**CLINICAL EXAMINATION**

Detailed clinical examination is indispensable in the management of UDT. Literature would repeatedly reveal that detailed clinical examination is more sensitive than ultrasonography (USG) or a CT scan (3). Before labeling a testis as impalpable, careful repeated clinical examinations have to be done (4). Palpation has to be repeated once again under anesthesia, before laparoscopy (3).

**Fallacies**
1. Canalicular testes may be impalpable in up to 30% of the cases (22, 27) [if they are palpable in the groin, they should be classified as inguinal ectopic testes (27)].
2. A fat child, unco-operative child, small testes, emergent testes, cold weather, crying baby with cremasteric action-are all the reasons for false negative findings (4, 5, 9). Making the baby cry, making him squat down or putting him in warm bath - can help you locate the testes which others have missed (19).
3. In children less than 2 years, there is hardly any length of inguinal canal. In them, an impalpable testis is either abdominal, atrophic or absent. It is unlikely for the canalicular testes to impalpable in infants (11).

There is unanimity among members that, in a child with palpable testis orchidopexy is to be done without any imaging studies. Debate of Imaging study v/s laparoscopy exists only for impalpable testes.

**IMAGING STUDIES V/S LAPAROSCOPY**

Considerable disagreement exists between members regarding utility v/s futility of imaging studies. Arguments favoring Imaging studies (mainly USG):

1. USG is cheap, freely available, painless, no radiation, no anesthesia required, (only sedation may be required) (4, 5).
2. A positive USG supplements clinical examination and avoids an invasive procedure like laparoscopy (4, 5, 16, 21, 22).
3. USG is helpful in looking for associated anomalies (20).
4. Pick-up rate of USG in the hands of an expert sonologist is above 95%, with high resolution sonography with a 7.5 MHz probe (5). When in doubt, sonologist can switch on the Doppler mode to differentiate testis from a Lymph node (4).

**Arguments against imaging studies**

1. A large number of members do not believe in the utility of imaging studies (6, 11, 13, 18, 29, 30, 31). They consider that USG, though it is less invasive, it is more evasive (6).
2. No matter what is the USG report, one has to explore. Otherwise, one may miss out on a testis. If a testis is not found on USG, it becomes very difficult to convince the parents for exploration (11, 18 and 23). Even a CT scan/MRI can (mis)locate a testes and, if the testes is not found on laparoscopy/exploration, then it becomes difficult for the parents to cope up (29, 11, 13, 18, 19). Parents feel that an unnecessary operation has been performed based on a false report (11).
3. A negative USG report may prompt the pediatrician to convince the parents against exploration. Even if a multi-centric study is designed, the concerned sonologist should mention in their report that USG is not a sensitive tool to locate the testes (6).

**Arguments in favor of laparoscopy (without imaging studies)**

1. If a testis is absent on clinical examination (but located on USG), such a testes is likely to be an emergent testis. In such a testis, Laparoscopic mobilization is better and results in less tension (11).
2. In boys less than 2 years, there is hardly any inguinal canal. In such babies, an impalpable testis is either abdominal, absent or atrophic - Laparoscopy would be the answer to all such conditions (11).
3. Laparoscopy helps the pediatric surgeon to locate the testes and allows the choice of best approach (11). It has eliminated the uncertainties and offers a clear-cut algorithm in the management of UDT (29).
4. Cost is not increased significantly (11).
5. There is no need to correlate USG finding with Laparoscopy findings to the parents (11).
6. Literature reveals that Laparoscopy locates those
there is considerable crushing of testicular substance. There is consensus among members that bilateral testes are to be operated simultaneously (2). However, many a testes improve in size and consistency (6). Small and atrophic testes is excised and sent for HPE (12).

If no testicular vessels are seen, procedure can be abandoned (1,6,12). If testicular vessels are seen entering the ring (normal/atretic), there is no reason to bring it down, as, many a such testes improve in size and consistency (6). Small and atrophic testes is excised and sent for HPE (12).

In case of Vas entering the open internal ring - an attempt should be made to laparoscopically mobilize the Vas and vessels - so that the Inguinal exploration becomes easier (12).

9. If the testes is proximal to the internal ring and length is inadequate following maximal mobilization, testes is taken to scrotum in a straight path - Laparoscopic Prentiss technique (12).

Inguinal exploration - opinions and arguments

1. There is consensus among members that bilateral palpable testes are to be operated simultaneously (4,5,9,11,12,19,21,24-28) It is economical, avoids another GA, (5) though the scrotum requires some stretching (19).

2. There is consensus that the nubbin needs to be excised (13, 3, 10, 6, 11 and 14) Incidence of germ cells is about 8-10%. Malignancy has been reported in nubbin of young boys (13, 10). While most of the nubbin can be excised inguinally, it can also be tackled through laparoscope or through midline scrotal incision used for fixing the opposite testes (2). However, there are

Arguments in favour of initial inguinal exploration for all cases of UDT (palpable/impalpable)

1. No study till date has shown USG to be reliable in evaluating impalpable testes, nor can it pick-up remnant/nubbin in the inguinal canal (13).

2. Laparoscopy may unnecessarily be done for impalpable canalicular testes or for its remnants in the inguinal canal, which may not be palpable even under anesthesia (13). Hence, the concept of initial Inguinal exploration for all the testis is gaining popularity in the west (including Snodgrass, Jayant Radhakrishnan) (13).

3. However, if the testis is not found on inguinal exploration, the surgeon should be prepared to do a laparoscopy (13).

ALGORITHM BASED MANAGEMENT

To avoid the confusion in the management, couple of members favor the following algorithm in the management of UDT (8, 20)

Decision-making during diagnostic laparoscopy/laparorchidopexy

1. On laparoscopy, if the testicular vessels are seen entering the internal ring, only then, inguinal exploration is required.

2. Absent testicular vessels, closed internal ring, poor peri vasal vasculature, make it almost improbable for the testicular remnants to be present in the inguinal canal (1, 6).

3. Testes are deemed to be absent if neither testis, nor testicular vessels are seen on laparoscopy (6,12).

4. Occasionally, vas may enter the ring alone, with a rudimentary epididymis and the testes may be in high abdominal location, with or without another tiny epididymis (uro-genital non-union) (1).

5. In testicular vanishing syndrome, if the vascular accident has occurred before 28th week of gestation, no testicular trace would be found, vessels would be atretic, ending blindly in the retro-peritoneum only – they will not be entering the internal ring (1). If the vascular accident has occurred after 28th week of gestation, testicular vessels would be seen entering the internal ring. The testes will not vanish entirely - remnants of the testicular microstructure would be seen in the retrieved nubbin (1). Probably, such a nubbin gets its vascularity from the Vasal artery (6).

6. When the vessels are of good caliber and leach of vessels is pink,, even if the testis is small, it is better to bring it down, as, many a such testes improve in size and consistency (6). Small and atrophic testes is excised and sent for HPE (12).

7. If no testicular vessels are seen, procedure can be abandoned (1,6,12). If testicular vessels are seen entering the ring (normal/atretic), there is no reason to look for testicular tissue at the renal hilum by reflecting the colon (12). Testicular moiety maintains a normal relationship with the vessels, although the vas and epididymis may not correspond with testes (1).

8. In case of Vas entering the open internal ring - an attempt should be made to laparoscopically mobilize the Vas and vessels - so that the Inguinal exploration becomes easier (12).

Arguments against laparoscopy as an initial diagnostic tool

1. Leap-froging over USG, is being a bit trigger happy (5). Laparoscopy is an invasive investigation, requiring GA and violates a virgin peritoneal cavity (4).

2. There is considerable crushing of testicular substance during laparoscopy. The way testis and vas are held with Maryland’s are unacceptable (4).

3. In clinical practice, truly intra abdominal testes, which cannot be tackled through inguinal route is rare (9). So, laparoscopy can be limited to those cases where testes is impalpable in two clinical examinations, USG is inconclusive and testis is impalpable under GA, just prior to laparoscopy (16).

4. Parents should be counseled before sending them for USG - those surgeons who are not willing to counsel before USG, must have enough counseling skills to convince parents for laparoscopy/direct exploration. So, either way, counseling is required (7).

5. Members, who denounce laparoscopy as an initial diagnostic tool, are not averse to using laparoscopy in truly intra abdominal testes (4, 5). They are well aware of the benefits offered by laparoscopy. However, they hesitate to do a laparoscopy first and then realize that the testes could have been dealt through inguinal incision (4, 5).

Testes which have been missed even on inguinal exploration (29).
some reports in the literature that the risk of malignancy is minimal (3).

3. When UDT is grossly atrophic, most of the members favor fixation of the contra-lateral testes (1, 6, 11) many would prefer sub-dartos suture less fixation (1, 3, 16) with eversion of tunica vaginalis. Passing a suture through tunica vaginalis would damage ipsilateral and contra-lateral testes, as transgression of blood testes barrier results in generation of antibodies (3, 7, 8).

4. Members have rarely encountered recurrent torsion following fixation (4,6-8), however, literature has plenty of reports of recurrent torsion following suture orchiopexy (3) Suture fixation induces only flimsy adhesions in contrast to opening and evertion the tunica vaginalis (3).

5. Though the intention of fixation of contra lateral testes is to prevent torsion, (1, 11) there is no evidence in literature that a vanishing testes increases risk of torsion for contra lateral testes. Perinatal torsion is extra-vaginal and hence does not increase the chances of intra-vaginal torsion occurring later in life (13).

Biopsy

1. When the testis is to be preserved, it is not advisable to take a biopsy. Biopsy would breach the Blood-testis barrier; the resulting anti-sperm antibodies can damage the healthy contra lateral testis by sympathetic destruction (10). Also, in the absence of frozen section, biopsy is not going to change the line of management (10).

2. In clinical practice, it very rare to find a very high abdominal testes, which cannot be brought down by inguinal exploration (9). For those who have no access for laparoscopy, abdominal exploration through inguinal incision is a decent alternative (5).

3. Orchidometer - very few members have used it (19, 17, 13) It can be indigenously prepared, but has limited value in follow up. It can only confirm atrophy at follow up - which has no therapeutic consequences (19). It may be of use in documenting the testicular size in retractile testes, varicocele, or in clinical studies involving measurements of contra lateral testes in unilateral UDT. (19,13).

Anesthesia

Majority use GA, however, increasing number of pediatric surgeons are using caudal epidural (23, 4) Caudal block supplemented by initial dose of Ketamine would not only give adequate anesthesia, but also would give 4-6 hours of post-operative analgesia and hence a smooth recovery from anesthesia.(4). It does not add to the OT time, as it takes just a few seconds to administer (4).

Proposed double-blind randomized multi-centric study:

(to know the efficacy of imaging studies in UDT)

1. Such a study is welcome by many members (7, 11, 14, 17 and 19).

2. Why do we need a randomized controlled study? There is considerable disagreement on the utility of Imaging studies. There is lot of ‘testimony’, little ‘evidence’ and some ‘bias’ in the opinions expressed by the members (19).

3. USG reports that are contrary to the operative findings (false +ve and false -ve) are well-remembered. But reports that are proved correct at surgery (true+ve and true -ve) are usually forgotten. (19).

4. So, we have to find out whether ‘USG should be recommended as an essential investigation in all cases of palpable UDT’ (19).

5. Such a study would stand as a point of reference for consumer forums (7). That would also help the radiologist to be more specific and sensitive about reporting impalpable UDT (7).

Why a multi-centric study (MCS)?

Utility of USG is mostly influenced by the machine and the man behind the machine. No two sonologists are same, hence, utility of USG has remained a factor of local comfort (7). A multicentric study would pool the expertise of various sonologists and arrive at a statistical standard. Idea of collecting data from more than one centre is to average out the skills(19).

Arguments against MCS (multi-centric study)

1. MCS are suitable for “Observation oriented studies”, as they tend to eliminate the inter-observer bias and inter-ethnic variations. MCS are suitable for rare diseases, so that a meaningful number of cases can be analyzed (10).

2. But, “Performance oriented studies” – like surgery or USG are not suited for MCS. By pooling data from several centers, we may arrive at a conclusion like “USG frequently misses UDT and hence, USG is not a good investigation for UDT”. But, the truth may really be, “sonologists in most centers are inexperienced and need to improve their skills” (10) so, instead of assessing the utility of USG, we would end up assessing the skills of the sonologists and the efficacies of the machines used by them. Such a study should best be conducted by radiologists themselves (17, 10).

3. To eliminate the variability of the sonologist’s skills, two double blinded sonologists may have to do USG for each patient at each center – which is not feasible (10) Instead of MCS, single centre study of meaningful number of cases, by a meticulous observer would suffice. Meticulous observation is an orphan in MCS, as they tend to eliminate the inter-observer bias and hence does not increase the chances of intra-vaginal torsion occurring later in life (13).

4. For MCS, a more suited topic would be ‘Contra-lateral Testicular hypertrophy in Unilateral UDT’ (13) Aim is to determine whether ipsilateral testicular position,
patient age or presence of vanishing testes would influence the size of contra-lateral testes or not (13).
5. Instead of MCS, a Meta-analysis of the literature has been suggested (16) However, most meta-analysis are plagued by poor research, upon which we would be drawing conclusions (15)

What hypothesis are we going to prove?
Following suggestions have come from the members:
1. Whether impalpable testes are localized by USG: and whether the sonologists are able to determine the size of the testes (19)
2. Null hypothesis that the sonologists are unable to locate or estimate the size of testes. (10).
3. USG is not required/USG is unreliable/direct surgery is best for impalpable testes (7)

SUGGESTIONS
Following suggestions have been proposed by the members:
1. Fermi’s method to be applied (19, 7) Fermi would break a problem into pieces, start with a piece that he is familiar with. Then, he would work piece by piece through the problem until he had arrived at a solution. Usually, this solution is incredibly accurate despite his string of estimations. All errors are expected to cancel themselves out.
2. Radiologists should be involved in the study (7,19,17).
3. A questionnaire should be prepared, with objective definitions of things we want to evaluate. Vague terms like nubbin etc should be clearly defined (17).
4. Data should be made numeric by assigning grades or scores from –1 to 5 to all findings (17).
5. Data should be representative of all the age groups (pre- or post-pubertal) and coming from similar cohort (17)
6. A simple Protocol should be followed - (1) All surgeons would get a USG done for impalpable testes, irrespective of whether they believe it or not. (2) Whatever be the USG report, all patients would undergo exploration/laparoscopy. (3) Sonography report is verified at surgery. (19)
7. All the details are numbered - like clinical 1, USG 1, Lap. findings 1, Op findings 1, etc. Other imaging studies like MR or CT are also numbered
8. Data are pooled at state level or by the principle investigator. Principle Investigator would use the services of third-party specialists to arrive at conclusions. Third party specialists (Radiologists and pediatric surgeons) would be chosen from all over India. (7)
9. Only the principle investigator would know the correlation between USG findings and operative findings. The third party specialists are double-blinded by jumbling the numbered data. (7)
10. SG reports, USG image, CT, MRI are peer reviewed by radiologists only. Similarly, operative findings, photographs, laparoscopy photographs are peer reviewed by pediatric surgeons only. All these specialists are double-blinded. Their opinion would be collected by the principle investigator and a statistical conclusion is drawn (7).

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