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"Laparoscopic Excision of Urachal Remnant - A Viable Approach"

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ABSTRACT

Background:
Urachus is a fibrous remnant which forms by obliteration of allantois in early infancy. The failure of obliteration of allantois results in formation of urachal abnormalities, which is a rare condition. Because of the non-specific clinical presentation, a high index of suspicion is required for diagnosis. Surgical excision is advised as there is a risk of malignant transformation. Laparoscopic excision of urachal remnant is described, but not very commonly performed. This study describes a new technique of complete laparoscopic excision of urachal remnants.

Material and Methods:
Research was carried out in the form of a Hospital-based prospective observational study, in which we present our technique of laparoscopic excision of urachal remnant. From January 2015 to March 2020 we performed 09 laparoscopic excision of urachal remnant. Six male and three females with median age of 23 years were enrolled in this study. The operation was performed with the use of three ports, one 10 mm port and two 5 mm ports. The clinical results, the perioperative records and the pathologic results were evaluated.

Results:
The median age of the patients is found to be 23 years. The median operative time was 92.88 min and median hospital stay was 3.1 days. The technique offered a better intraoperative view and complete excision of urachal remnant. No patients developed intra or post-operative complications. Histopathology revealed infected urachal sinus in 03 cases, infected patent urachus in 02 cases, patent urachus in 02 cases and 02 cases of urachal cyst.

Conclusion:
Complete removal of symptomatic urachal remnant and medial umbilical ligaments with this laparoscopic technique is a minimally invasive modality which is safe and effective with minimum morbidity with better cosmetic outcomes and early return to work.

Keywords: Urachal remnants,Allantois remnant, Laparoscopic excision, Medial umbilical ligament.

I. INTRODUCTION:

During the early fetal development, allantois at the umbilicus is connected to the dome of bladder with a tubular structure known as urachus, which drains urine. Usually the lumen of urachus gets closed by twelfth week of gestation and by the birth it completely gets obliterated and forms median umbilical ligament[1].The urachal anomalies/remnants arise, if this obliteration fails, which ranges from urachal cyst, urachal sinus, patent urachus and vesicourachal diverticulum. These are rare congenital anomalies, occurs in 1.6% of children below 15 years of age and in 0.063% of adults[2].The diagnosis is made by clinical suspicion and radiological evaluation with USG abdomen & abdominal wall and CT/MRI. Urachal anomalies are usually detected in childhood as discharging sinus or discharge of urine from umbilicus. In adults it occurs rarely and can present with abscess, discharging sinus or umbilical granuloma[3-4]. It can also present as acute abdomen in emergency. Surgical excision is advised due to the risk of malignant transformation, recurrent infection, discharge and sepsis[5-8]. The traditional approach has been open surgery with a transverse or midline incision which is associated with higher morbidity and recovery time. Laparoscopic surgery has been reported for excision of urachal remnants with advantage of being less invasive and with lower morbidity[9-13]. Various techniques of laparoscopic excision are explained but the numbers of cases performed laparoscopically are few. We herein report our technique and result of urachal remnant excision laparoscopically.

Aims & Objectives:
The study aims to summarize the outcome of 09 patients who underwent laparoscopic excision of urachal remnant with our technique with following primary objectives.

1. Clinical results
2. Perioperative records
3. Pathologic results

II. MATERIALS AND METHODS:

A prospective study was conducted at our department, which included nine patients (male =

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6; female = 3), who were in the age group of 17 – 28 years.

Inclusion criteria: Patients presenting with either an umbilical discharging sinus, an abscess or a granuloma.

Exclusion criteria: Patients with recurrence or who were previously operated for urachal remnant disease.

Study period fromJanuary 2015 to Mar 2020.

Study design [Figure 1]

Patients were thoroughly evaluated based on demography details, clinical profile and the findings were recorded as per study proforma.All were subjected to USG abdomen and CECT abdomen to confirm the diagnosis and to see the extent of disease. All the patients were offered excision of urachal remnant by laparoscopic surgery as a definitive treatment. Antibiotics were administered and drainage was performed as an initial treatment and excision of urachal remnant by laparoscopic surgery wasperformedafter several months of acute symptoms.

The clinical outcomes of laparoscopic excision of urachal remnants and medial umbilical ligaments, the perioperative records, and the pathologic results were evaluated.Patients were followed up on regular basis to observe for any complication.

Surgical procedure

All patients operated under general anaesthesia. Patients were catheterized with Foleys catheter either in pre-operative room or in the operating suite. Patient placed supine with console of laparoscopic instrument at foot end of the patient and surgeon standing at head end of patient. Transverse incision of 10 mm size was made in the epigastric region and 10 mm port was placed using open technique and the pneumoperitoneum was created using CO2 insufflation to maintain intrabdominal pressure of 12 mm Hg. 30-degreelaparoscope was inserted through the 10 mm port and inspection was done and the intraoperative findings were recorded. Another two 5 mm port was placed under vision, one in left hypochondrium and one in right hypochondrium as shown in Figure 2. Head low position of the patient was made so that the gut moves away from the field of surgery. Any bowel or omental adhesions from inflammatory reactions of the infected urachal remnant and medial umbilical ligaments were separated using ultrasonic scissors / monopolar cautery with endo-spatula or endo-hookas shown in Figure 3. Median & medial umbilical ligament was dissected from anterior abdominal wall using ultrasonic scissor / monopolar cautery with endo-spatula or endo-hook all along its length. Endo-loop ligature made of catgut suture 1/0 was placed at caudal stump of median umbilical ligament including a small cuff of the dome of urinary bladder. Bladder was filled with methylene blue dye mixed saline till the bladder is full and observed for any leakage from the divided median umbilical ligament. The excised specimen was extracted from one of the port and sent for histopathological examination. Haemostasis was confirmed, pneumoperitoneum deflated and 10mm port site was closed and sterile dressing was done.

III. RESULTS

Patient's characteristics and study results are summarised in Table-1 and Table- 2 respectively. The median age of the patients was 23 years (range 17–28). The range of time delay between acute symptoms and surgery was 3 – 9 months and average 5.4 months. The range of operative time was from 62 minutes to 129 minutes and average operative time was 92.88 min. The first few cases took long time as the experience of surgical team was limited in these cases, as the team got experience the time taken to perform the surgery improved. Minimum post-operative hospital stay was 2 days and maximum was 5 days with average of 3.1 days. Post operatively patient had mild to moderate pain which could be managed with NSAIDs. All patients were allowed oral diet on 1st post-operative day and tolerated well. In our series of cases there was no intraoperative and postoperative complication. Histopathology revealed infected urachal sinus in 03 cases, infected patent urachus in 02 cases, 02 cases of patent urachus and 02 cases of urachal cyst. Post operatively patient resumes his/her routine activities after 02 days of discharge and full activities after about 2 weeks. Patients were followed up on regular basis and no long term complication was observed. Patients were advised about the likely possibility of malignant transformation of remnants and advised for yearly follow up in surgery OPD or SOS if any complaints.

IV. DISCUSSION

During the early fetal development, allantois at the umbilicus is connected to the dome of bladder with a tubular structure known as urachus, which drains urine. As the foetus develops, bladder descends to the pelvis and the urachus elongates. Usually the lumen of urachus gets closed by twelfth week of gestation and by the

birth it completely gets obliterated and forms median umbilical ligament[1,3,5]. It occupies the space between the peritoneum and fascia transversalis in midline (space of Retzius).

When the obliteration of urachus is not complete it can persist as four different pathologies: patent urachus, umbilical sinus, vesicourachal diverticulum and urachal cyst[5,6]. In patent urachus there is a communication between the bladder and the umbilicus and can present as discharge of urine from umbilicus when the bladder is full. In umbilical sinus, the urachus opens into the umbilicus. Here, drainage in form of serous fluid or pus from the umbilicus will often be present. The vesicourachal diverticulum is with a wide and patent opening into the bladder. Urinary complaints are often present with this type. In urachal cyst, there is cystic structure within its length which becomes prominent when it gets infected or when cyst ruptures. Inflammation commonly occurs in children and young adults. Infected urachal cysts are rare after fifth decade. The urachus anatomically resides in a clinically silent region, in extraperitoneal space of Retzius. As a consequence, possible symptoms and clinical signs may be absent or delayed. An infected urachal remnant can present as acute abdominal condition with abdominal pain, abdominal tenderness, fever, nausea, vomiting, dysuria, voiding difficulty, urethritis, epididymitis, umbilical granuloma, pus discharge from umbilicus and tenderness around umbilicus and orchitis[14]. Intravenous antibiotic is the initial treatment of choice for infected urachal remnant. Surgical management is the definitive treatment to prevent infection and malignant transformation in later life[3,4].

USG and CT scan is mainstay of diagnostic investigation for urachus remnant, and voiding cystourethrography and fistulography can also be used. USG is generally sufficient to diagnose an infected urachal remnant[14]. E. coli and proteus are the most common infecting pathogens but a variety of other pathogens can also be found[15]. The differential diagnosis of urachal abscess include conditions presenting as acute abdomen and should also include cellulitis, necrotizing fasciitis, hematoma, ventral or umbilical hernia and tumour especially when it develops into the anterior abdominal wall[16]. The treatment of infectious urachal remnants include antibiotic therapy, draining the abscess cavityfollowed by excision.

It is observed that urachal remnant can transform to malignancy and therefor recommended that all urachal remnants should be excised to avoid possible malignant transformation later in life[7,8]. Urachal carcinomas represent 1% of all bladder cancers. Urachal neoplasm, despite being attributed only to a little percentage of bladder cancers, 34% of bladder adenocarcinomas known to possess urachal origin. The pathogenesis of urachal adenocarcinomas is not fully known but may be assigned to metaplasia of the remnant epithelium. Alternatively, patients with remnants, lacking epithelial tissue, hold a very low risk for malignant transformation.

Most effective management protocol for infected persistent urachal remnant is pre-operative percutaneous drainage and subsequent elective excision. Due to the possibility of malignant transformation of epithelial remnant radical excision of the median umbilical ligament is advised. Radical excision includes excision of every structure within the umbilicovesical fascia, which includes the urachus and each medial umbilical ligament, and also involves associated peritoneum from the umbilicus to the bladder dome. For benign lesions not communicating with the umbilicus or bladder, there is no consensus on whether the umbilicus and a bladder cuff resection should be done routinely. Most of the reports of urachal excision do not mention regarding umbilical resection.

This procedure is traditionally performed by open surgery and a long midline incision is given in the lower abdomen. This long scar is associated with morbidity, delayed return to work, post op pain and cosmetic disadvantage. To relieve the troubles of open surgery, laparoscopic excision of the urachal remnant was first described in 1993 by Trondsen et al.[14] Since then, there have been many trials of laparoscopic surgery for managing urachal anomalies, as laparoscopic surgery is minimally invasive and it provides less morbidity, early return to work, less post op pain and better cosmesis[9-13]. The umbilical approach may be better in infants as the distance between the umbilicus and the dome of the urinary bladder is short. The laparoscopic surgery is recommended for older children and adults[11-13].

Our technique of laparoscopic excision of urachus remnant is distinct and advantageous from other described techniques in terms of port placement, better intraoperative view, ability for complete resection of urachus remnants and ability of simultaneous umbilical resection & umbilicoplasty.

Advantage in our technique is that, 30-degree laparoscope inserted through the 10 mm port in the epigastrium, provides an excellent view of the entire length of the urachus and medial

umbilical ligaments and allows adequate access to both the umbilicus and the bladder dome, without any struggle. Other two 5 mm working ports placed one in left hypochondrium and one in right hypochondrium gives good ergonomic comfort for dissection.

Our technique with specific port placement, providing better view and ergonomic ease of working, allows complete resection of urachal remnants. This gives advantage over other techniques, as due to limited view in other described techniques, chance of incomplete resection is high leading to recurrence.

Also this technique allows ease in simultaneous resection of umbilicus and allows umbilicoplasty when indicated, which is achieved with more difficulty in other techniques.

The mean total operative time of this technique was shorter as compared to other techniques. Average hospital stay for patients in this technique is 3.18 days which is comparable with other studies. In this study there was no intraoperative or postoperative complication occurred. Also the patients were followed up on regular basis and no long term complication/ recurrence was observed.

V. CONCLUSIONS:

Urachal abnormalities are rare in adults. Clinical presentation is not specific, and a high suspicion is required for diagnosis. When it is diagnosed, surgical excision is advisable as there is a risk of malignant transformation.

Laparoscopic approach for excision of urachal remnant is a safe, effective and less invasive method. Our technique of laparoscopic excision of urachus remnant is distinct and advantageous from other described techniques in terms of port placement, better intraoperative view, ability for complete resection of urachus remnants and ability of simultaneous umbilical resection & umbilicoplasty when needed. However, a prospective, large, multi-center randomized study is needed to validate same.

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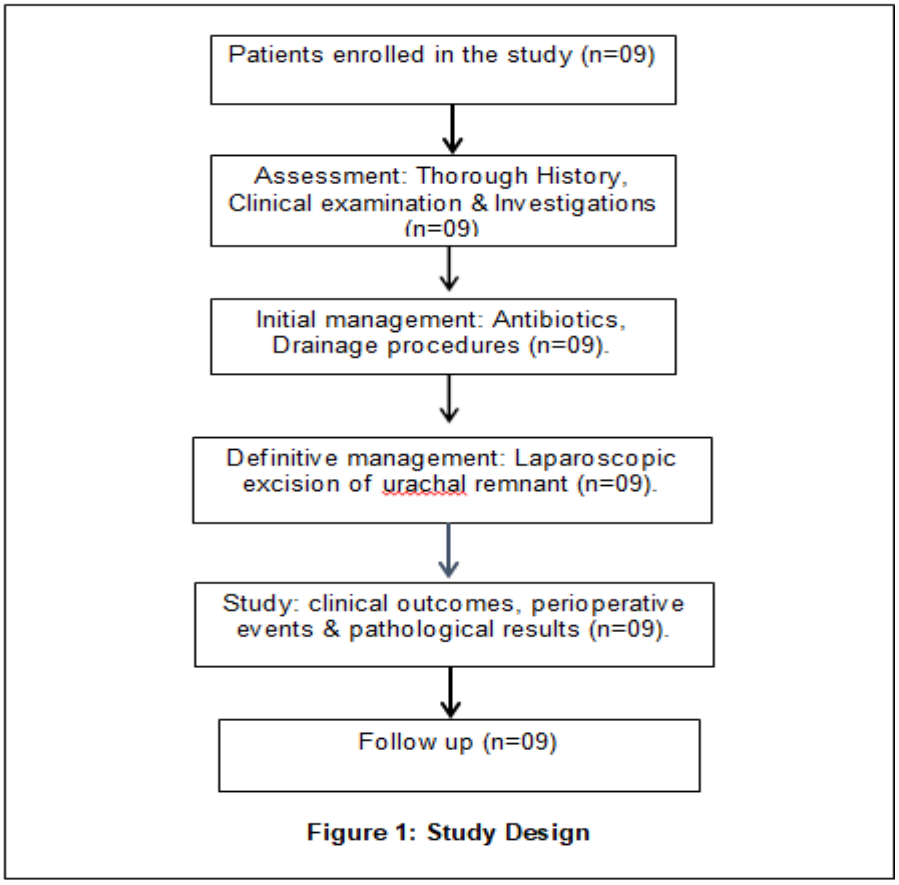

Figure 1: Study Design

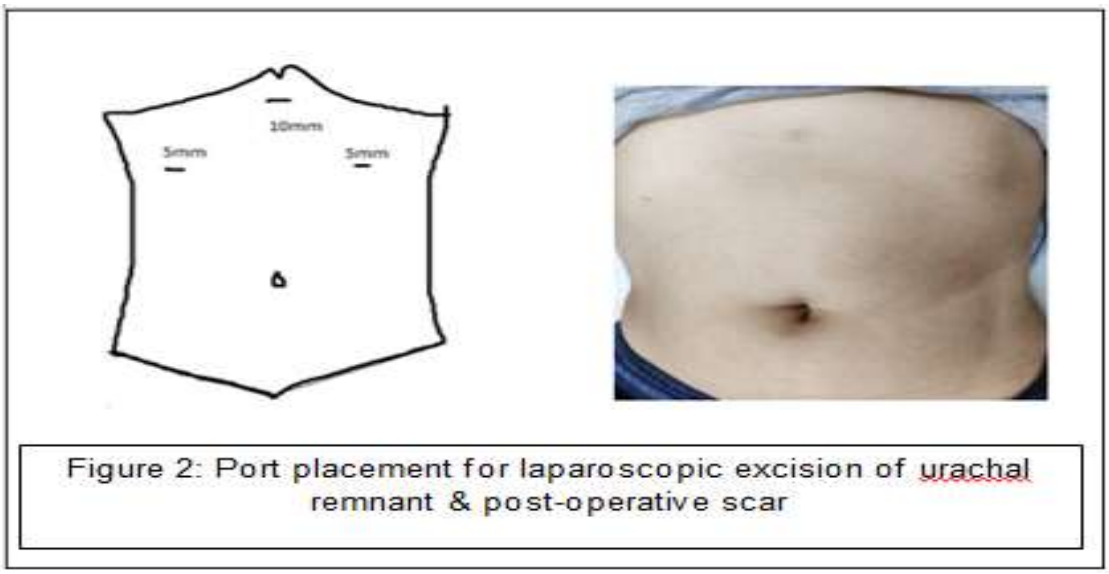

Figure 2: Port placement for laparoscopic excision of urachal remnant & post-operative scar

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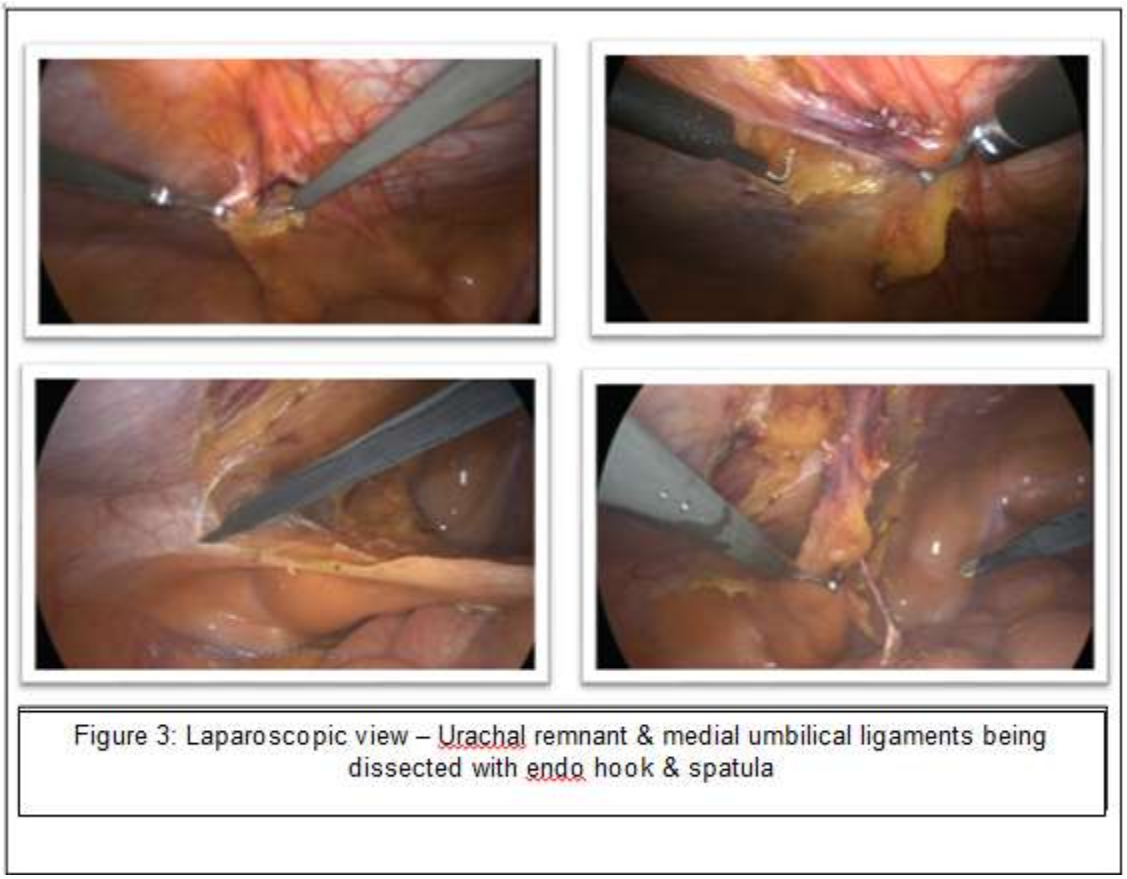

Figure 3: Laparoscopic view – Urachal remnant & medial umbilical ligaments being dissected with endo hook & spatula