Bladder exstrophy closure using anterior pelvic osteotomy of superior pubic rami

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Abstract:

Background: Bladder exstrophy is a rare and complex urogenital malformation. The current surgical approach consists of early closure followed by other procedures later on aiming for continence. Primary closure usually requires some form of osteotomy to facilitate successful bladder and abdominal wall repair. For decades, bilateral posterior iliac osteotomy has been the most commonly used technique. A new osteotomy technique, consisting of anterior pelvic ostecotomy of the superior pubic ramus, seems to be a safe and quick alternative method to obtain tension-free approximation of the symphysis pubis

Patients and methods: A prospective study between 2006 and 2013, were 10 (9 males and 1 female) newborns underwent surgery for bladder exstrophy closure in the pediatric surgery department, using anterior pelvic osteotomy of superior pubic rami to achieve tension-free approximation of the symphysis pubis and successful repair.

Results: Successful closure was achieved in 90% of the patients operated upon. Only 1 patient had wound dehiscence and failure of the repair. The procedure was safe, quick with minimal blood loss and was performed by the pediatric surgeon without the need to an orthopedic surgeon.

Conclusion: Anterior pelvic osteotomy of superior pubic rami in an effective alternative measure to obtain tension-free approximation of the symphysis pubis, and hence successful bladder exstrophy repair. It provides further advantages namely, ease and rapidity, minimal blood loss, and no requirement for an extra skin incision or patient's repositioning.

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Introduction:

Bladder exstrophy is a rare and complex urogenital malformation with an incidence that varies between 1:10,000 and 1:50,000 live births, affecting boys 5 to 6 times more often than girls (1). The current surgical approach consists of early closure and later surgery for continence aiming, if possible, to achieve satisfactory urinary storage, continence and bladder emptying by the time the child enters school(2).Primary closure with approximation of the pubic bones is generally regarded as the initial procedure of choice for patients with this malformation. Even if this is accomplished during the first few days of life, primary closure usually requires some form of osteotomy if the pubic bones are to be brought together without undue tension(3).Patients with bladder exstrophy demonstrate pubic diastasis with external rotation of the ilia and posterolateral orientation of the acetabula. Osteotomy serves to approximate the pubis and thus facilitate genitourinary repair (3).Furthermore other advantages can be obtained from this procedure, among them the enhancement of penile lengthening as a result of closer juxtaposition of the corpora (3). In addition, improved continence due both to placement of the urethra within the pelvis and to approximation of the levator ani around the urethra has been hypothesized by many authors (3).Pelvic osteotomy performed at the time of initial closure is recommended for a variety of reasons: It aids in tension-free approximation of the bladder, posterior urethra, and abdominal wall. It allows placement of the vesicourethral complex deep within the pelvic ring to enhance bladder-outlet resistance. Finally it provides alignment of the large pelvic floor muscles to support the bladder neck (1).Traditionally, bilateral posterior iliac osteotomy has been the most commonly used technique in patients undergoing primary closure of bladder exstrophy, but several other techniques are available. A new osteotomy technique, first described by Frey and Cohen in 1988 and consisting of anterior pelvic osteotomy of the superior pubic ramus, seems to be a safe and quick alternative method to obtain tension-free approximation of the symphysis pubis(3).

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Patients and Methods:

Between 2006 and 2013, a total of 10 newborns (9 males and one female) with bladder exstrophy underwent surgery in the pediatric surgery department. The babies were all full terms with their body weights ranged from 2.5 to 3.5 kg. Their ages ranged from 1 to 5 days at the time of the procedure. Anteriorly displaced anus was observed in 4 babies. No further associated anomalies were recorded and abdominal ultrasound obtained prior to surgery in all patients revealed no associated anomalies of the upper urinary tracts. After general anaesthesia was established, the ureteric orifices were cannulated using size 6 feeding tubes, the skin around the exstrophic bladder was incised and the exstrophic bladder was dissected retroperitoneally from the abdominal wall.The bladder was closed in two layers and the posterior epispadiac

urethra reconstructed over 10 F urethral catheter. After initial bladder closure, the superior pubic ramus was identified at the lateral border of the rectus abdominis sheath, and then divided with a bone-cutting forceps. Sometimes diathermy was used. Care must be taken to avoid injury to the inferior periosteum and obturator nerve and vessels. After completing the pubic osteotomy bilaterally, both pubic bones are tilted medially and approximated using one or two polyglactin-1 or -2 sutures. Before securing the polyglactin sutures, it is important to make sure that the proposed bladder neck and urethra are positioned deep to the approximated pubic bones . Wound closure is started by approximating both rectus muscles which, after completing the osteotomy, are easily approximated using interrupted absorbable sutures. Finally, the skin is closed. Postoperatively, all patients were immobilized by means of Bryant's traction for 2 weeks. Broad spectrum antibiotics were given. The vesical catheter was removed at day 10 and the two ureteric stents were removed at day 11 and 12 respectively. After discharge from the hospital all patients were followed up at one, three, six and 12 months intervals. Data were analyzed using SPSS version 20. Fisher exact test was used to analyze difference between categorical variables. P. value < 0.05 was considered significant.

Results:

90% of the newborns operated on were males and only one (10%) was female (figure.2). Their ages ranged from 1 to 5 days at the time of the procedure with a mean of 2.6±1.3 days (figure.3).Successful bladder closure was achieved in 9(90%) of the 10 patients operated on. Bladder plate was underdeveloped in two patients, and reconstruction was more difficult than in the remaining patients. One patient suffered from mild soft tissue infection which was treated conservatively by frequent wound dressing and appropriate antibiotic therapy and the repair remained intact. Only one patient had complete dehiscence of the repair. Osteotomy was easy, safe and quick in all cases. It was performed by the pediatric surgeon, and did not require the collaboration of an orthopedic surgeon. The operative time for both osteotomies ranged from 30 to 40 minutes. Repositioning of the patient was not required, blood loss was minimal and no blood transfusion was required in all patients, and tension-free approximation of the symphysis pubis was achieved. The 9 patients with successful repair were followed up to one year postoperatively and integrity of the repair was confirmed in all of them.

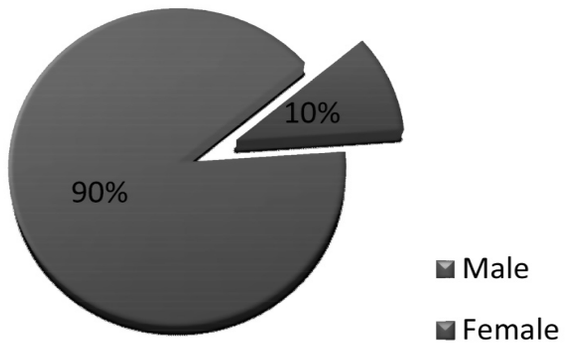
2 days old male newborn with bladder exstrophy

The same patient after repair

days old female newborn with bladder exstrophy 3

The same patient after repair

Postoperatively every patient was immobilized by means of Bryant's traction
Figure (1): Surgical repair in some patients of the study



Figure(2): Male to female ratio

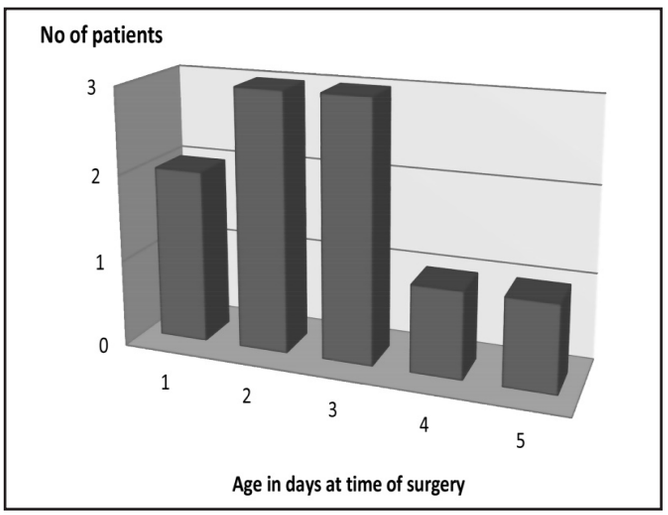


Figure (3): Age distribution at time of surgery.

Discussion:

Pelvic osteotomies have been described by many authors, and there are many different techniques that can be chosen according to the surgeon's preference and experience (4).In 1958, Schultz (5) described a bilateral posterior iliac osteotomy, which became a well-known technique for closure of cases with bladder exstrophy. However, it is a time-consuming major operation, usually performed by orthopaedic surgeons. Furthermore, this procedure requires repositioning the patient to complete the operation, which considerably increases the duration of the operation and of anaesthesia. In the late 1980s, Sponseller et al. (6) used the technique of anterior innominate osteotomy and approximated the pubic bones using an external fixator. It is an efficient procedure with none of the drawbacks of posterior osteotomy. However, it remains a major procedure and is usually done by orthopaedic surgeons. Other drawbacks of this type of osteotomy include increased blood loss and postoperative pain. Furthermore, in 1995 the combined anterior innominate with a posterior iliac osteotomy was used from an anterior approach (7). Other approaches, including an oblique iliac wing osteotomy, have been described, and some promising clinical results reported (8).Anterior pelvic osteotomy was first described by Frey and Cohen (9), when they used this type of osteotomy for children with bladder exstrophy. This type of osteotomy has many advantages; it is a versatile technique that could be used for both primary and re-do cases, regardless of patient age; the operative duration is reasonable, with no need to change the patient's position, and thus reduced anaesthetic exposure. Blood loss was minimized and blood transfusion was rarely needed. Anterior pubic osteotomy also has the advantage of being performed by the paediatric surgeon, with no need for an orthopaedic surgeon. 90 % of newborns in this study were males. This result is comparable to what is reported by Chiari et al. (3) and Elsayed et al. (4) who reported a male incidence of 80% and 86.6% respectively. The small difference in incidence may reflect the difference in sample size among these studies.The age of the patients ranged from 1 to 5 days at the time of the procedure. This is similar to what is reported in other studies (3). This reflects the fact that bladder exstrophy is an obvious congenital anomaly and diagnosis is made easily at birth which facilitates early surgical intervention. Successful bladder closure using anterior pelvic osteotomy of superior pubic rami in this study was achieved in 90% of the patients operated on. This result is comparable to what is reported by Elsayed et al. (4). It is slightly lower than what is reported by Chiari et al (3), which may be due to the small sample size in the latter study. Table(1)

Table: (1) Comparison of successful closure with other studies

Study	No of Patients studied	Percentage of successful closure
Ours	**10**	**90%**
Chiari et al.	**5**	**100%**
Elsayed et al.	**15**	**93%**

The procedure was easy, safe and quick and was performed by the pediatric surgeon and did not require the collaboration of an orthopedic surgeon. Repositioning was not required. Blood loss was minimal and blood transfusion was not required in all cases. The operative time for both osteotomies ranged from 30 to 40 minutes. These results were comparable to what is reported in other similar published studies (3, 4). In this study, failure of closure has no significant relation to age and sex groups of the patients studied. It is reported in 11.1 % among male patients compared to 0 % among female patients without a significant difference (P= 0.999). Failure of closure was noted in 1 patient aged 4-5 days (50%) compared to 0% among patients aged 1-3 days without a significant difference (P=0.200).

Conclusion:

Simple closure with anterior pubic osteotomy is a feasible and effective means to facilitate both bladder and abdominal wall closure for patients with bladder exstrophy. This technique has the advantage of being safe, quicker, does not require repositioning of the patient with minimal blood loss and easily performed by the paediatric surgeon without the collaboration of an orthopedic surgeon.

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