

Steel minus Salter (SMS) osteotomy in recurrent bladder exstrophy repair: a case report

Dr. Alshahid A. Abbak, ABOS,⁽¹⁾ **Dr. Khalid I. Khoshhal, FRCS Ed, ABOS**⁽²⁾

Consultant Pediatric Orthopedic Surgeon, King Fahad Medical City, Riyadh, Saudi Arabia⁽¹⁾
E-mail address: shahidabak2011@hotmail.com

Associate Professor & Consultant Pediatric Orthopedic Surgeon, Taibah University,⁽²⁾
Almadinah Almunawwarah, Saudi Arabia
E-mail address: kkhoshhal@hotmail.com

Abstract:

Bladder exstrophy is a very rare congenital disorder, in which the first stage of reconstruction is usually performed within the first 72 hours of life. The most feared form of failure of the reconstruction is postoperative dehiscence of the bladder and abdominal wall. We present an 11-year-old girl with bladder exstrophy. She underwent three iliac bone supra-acetabular osteotomies with repair of the bladder exstrophy. Unfortunately the diastasis of the symphysis recurred widely open with dehiscence of bladder and abdominal wall.

Bilateral pubic and ischial rami osteotomies with adequate soft tissue release were carried out, which allowed the urology team to perform a tension-free repair of the bladder and the abdominal wall.

Here we report an osteotomy with the soft tissue release that successfully allowed the closure of the pelvis, bladder and anterior abdominal wall in a recurrent case with more than three years follow up.

Keywords: Bladder exstrophy, Ischial osteotomy, Pelvic osteotomy, Pubic osteotomy, Recurrent repair, SMS osteotomy, Steel osteotomy.

Correspondence:

Dr. Khalid I. Khoshhal
Associate Professor,
Consultant Pediatric Orthopedic Surgery,
College of Medicine, Taibah University
P. O. Box 879, Almadinah Almunawwarah,
Saudi Arabia
E-mail address: kkhoshhal@hotmail.com

Introduction

Bladder exstrophy (BE) is a very rare congenital disorder, with a reported prevalence of 1 in 40,000 live births, that involves the lower abdominal wall, bony pelvis and genitourinary system.^(1,2) Although, BE itself is not a fatal condition, but until the 1970s its complications and treatment often resulted in death.⁽³⁾ With the new reconstructive surgical procedures, not only survival has become routine, but also the focus now is on a near-normal return to function and cosmesis while reducing the morbidity of the surgical interventions.⁽³⁾ Primary reconstruction of BE in newborns gives good long-term results. Usually, the first stage of the reconstruction is performed within the first 72 hours of life.

Children born with BE present a difficult surgical challenge and as all other major reconstructive surgeries, the best results are attained when success is achieved in the first operative attempt.⁽⁴⁾ The most feared form of failure of BE reconstruction is postoperative dehiscence of the bladder and abdominal wall.⁽⁴⁾ Tension-free closure and immobilization are important factors in both initial and subsequent closure of BE.⁽⁵⁾

Bony malformation in BE includes external rotation of the iliac bones leading to external rotation of foot progression,^(1,6) variable pubic diastasis, acetabular retroversion with compensatory femoral anteversion.^(1,6,7) The pubic diastasis increases steadily with age.⁽¹⁾

The main roles of pelvic osteotomy in treatment of BE are to relax tension on the bladder and abdominal wall repair during wound-healing, to prevent postoperative wound dehiscence and possibly to improve the outcome of genitourinary reconstruction to achieve better urinary control in older age and a more cosmetically appealing genitalia.^(1,4,5,8)

The success of BE soft tissue reconstruction is dependent to a large extent on how successfully the pelvic ring can be closed. Pelvic osteotomies have a proven track record to enhance success rates for BE reconstruction primarily or secondarily after initial failure.^(9,10) Repeat pelvic osteotomy is advised as a safe and effective part of repeat surgery, when a primary closure fails despite osteotomy.⁽¹¹⁾

Several osteotomy techniques are currently in use in repair of BE. Before 1958 none was

used.⁽¹⁾ The traditional osteotomies described are posterior⁽¹²⁾ and transverse,⁽²⁾ or a combination of both.⁽²⁾ In the late 1980s, Frey and Cohen reported the use of bilateral superior pubic rami osteotomy.⁽¹³⁾ Later the anterior oblique or diagonal pelvic osteotomy was introduced.⁽⁸⁾ Perović et al.⁽¹⁴⁾ and Frey⁽¹⁵⁾ described bilateral osteotomy of the superior ramus of the pubic bone and reported good results. Approximation of symphysis pubis was achieved in infants at the cartilaginous ischiopubic junction, while in older children fracture of the inferior ramus of the pubic bone allowed the approximation.

The advantages of bilateral superior rami osteotomy is that it is performed with the patient supine avoiding patient repositioning intraoperatively, less intraoperative blood loss and better approximation of the pubic rami at the time of closure.⁽¹⁾

Steel triple osteotomy of the ilium, ischium and pubis is a redirection osteotomy, which is circumacetabular. It was designed to achieve coverage of a dislocated or subluxated femoral head where other iliac osteotomies are ineffective.⁽¹⁶⁾

The current report was inspired by the Steel triple pelvic osteotomy with omission the Salter component (the transverse iliac osteotomy), to close the pelvis in a patient with three recurrences to help reconstruct the genitourinary system and anterior abdomen wall.

Case report

A female patient known to have bladder exstrophy was referred to our institute at the age of 11 years. She underwent three iliac bone and supra-acetabular osteotomies with repair of the bladder exstrophy at birth, at the age of three years and at seven years of age. All surgeries were done in other institutes. Unfortunately the diastasis of the symphysis recurred widely open (67 mm) with dehiscence of bladder and abdominal wall (Figure 1). She had an obvious out toeing gait with foot progression angle of almost 70 degrees. She stopped going to school because of the pelvic offensive smell. She was admitted and prepared for surgery by the orthopedic and urology teams.

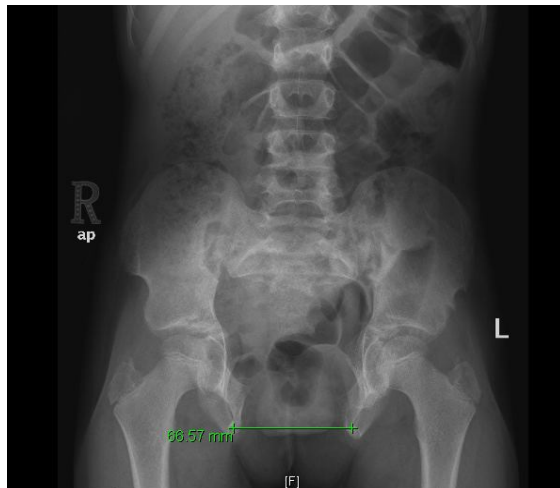


Fig. (1). Preoperative anteroposterior radiograph of the pelvis showing the diastasis of the symphysis pubis (67 mm).

Surgery

Beside the abdomen and pelvis, both hips and lower limbs were prepped down to the ankles and kept free on the table. Preliminary dissection of the bladder and abdominal wall was carried out. Patient was in supine position with hips flexed, abducted and externally rotated. A single groin incision was made transversely, one cm distal to the groin crease, crossing the tendon of adductor longus about one inch on each side. A plane was developed proximally between adductor longus tendon and pectenus muscle. A subperiosteal dissection of the superior pubic ramus was done and applying suitable retractors around the backside of the ramus, elevating the periosteum and obturator muscle origin. The osteotomy was then carried out using an oscillating saw and completed with an osteotome directed towards the protecting retractors. For the ischial ramus osteotomy, the interval between gracilis and adductor magnus anteriorly and the insertion of hamstrings posteriorly was opened by sharp dissection. After localization of the hamstrings insertion, dissection was carried superiorly along the ischial ramus. The periosteum was incised and a retractor passed around the Ischium to protect the structures beneath. The ischial ramus was divided similar to the superior pubic ramus. The same procedure was then repeated on the other side. After completion of the four osteotomies, it was still very difficult to

bring the two sides of the pelvis closer and it was obvious that an ample soft tissue release was necessary. Release of the adductor longus, brevis, and part of magnus and gracilis was needed. Using a reduction clamp, the two sides of the pelvis were approximated and held together with a two holes reconstruction plate and 3.5 mm screws, through the anterior abdominal incision (i.e. bladder repair approach). In addition to the plate, two strong sutures were passed through the symphysis to add to the stability. After the approximation and fixation of the two sides of the pelvis, the urology team was able to reconstruct the bladder and the anterior abdominal wall without tension (Figure 2).



Fig. (2). Immediate postoperative anteroposterior radiograph of the pelvis showing the bilateral osteotomy of the pubic ramus and the ischial ramus, with the fixation with the reconstruction plate and two screws.

Postoperatively the patient was put on straight skin traction for four weeks until reasonable callus was seen at the osteotomy sites. During this period in-bed physiotherapy was carried out daily. Weight bearing was allowed thereafter gradually using crutches, until the patient was back to normal gait.

The plate and screws were removed when one of the screws started backing up (Figure 3) to avoid complications related to hardware in this area.⁽¹⁷⁾ On three years follow up the four osteotomies healed without dehiscence. The external rotation gait improved to a normal foot progression angle (Figure 4).

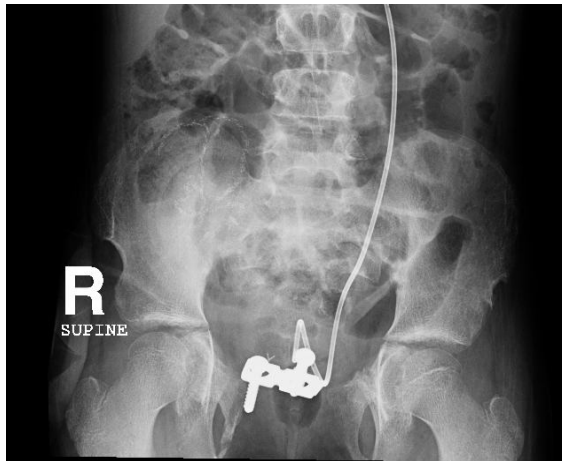


Fig. (3). Six-month postoperative anteroposterior radiograph of the pelvis showing backing up of the left screw.



Fig. (4). Three years postoperative anteroposterior radiograph of the pelvis showing the symphysis pubis diastasis to be around 22 mm after 30 month from the removal of the plate and screws.

Discussion

A failed BE closure is a significant complication with major impact on the long-term surgical outcome, ultimate function of the genitourinary system, and the well being of the patient. Successful repeat BE closure can be achieved in most patients when performed in conjunction with pelvic osteotomy and proper postoperative immobilization.⁽⁴⁾

The initial approach to a failed BE closure is mainly conservative regardless of the cause of failure.⁽⁴⁾ The timing of repeat surgery is important, and the temptation to rapidly repeat

the surgery should be resisted. In managing the case in hand, the authors inspected the wound for foreign bodies and devitalized tissues, and infection was ruled out with appropriate cultures.

Satsuma et al, (2006) suggested that an anterior or combined pelvic osteotomy corrects and maintains the pelvic ring with a BE more effectively than a posterior pelvic osteotomy.⁽¹⁸⁾ The choice of the osteotomy in the current patient was taken based on the previous failures and the current presentation. The patient had three iliac bone supraacetabular osteotomies that failed. The choice this time was for an osteotomy that can close the pelvis without going through the old procedures. The steel minus salter osteotomy (SMS) with the appropriate soft tissue releases helped achieving the repeat closure of the BE in this patient. The authors noticed that tension-free closure was not possible after pubic and ischial osteotomies alone. It was only after the generous muscle releases the symphysis pubis could be approximated and fixed with heavy sutures and a two hole reconstruction plate and screws.

It is reported that a certain degree of re-diastasis with growth is subsequently observed after osteotomy and repair. Although this complication is undesirable, it is observed in all osteotomy techniques.^(1,5) The case in hand showed backing up of one of the screws at six months after the indexed surgery, which could be explained by the previous observation. That led to the removal of the plate and screws to avoid reported complications such as erosion into the bladder neck and surrounding soft tissues.⁽¹⁷⁾ Although the plate and screws were removed six months after surgery, yet the symphysis distance stayed at around 22 mm (an improvement of 45 mm) at the three year follow up visit.

Although the osteotomy of the pubic rami is not new.⁽¹³⁾ But in what was described the approximation of symphysis pubis was achieved in infants at the cartilaginous ischiopubic junction, while in older children fracture of the inferior rami of the pubic bone allowed the approximation but the ischial ramus was not osteotomized.⁽¹⁴⁾

A repeat closure of the pelvis may offer some extra benefits with respect to correcting the pelvic rotational deformity.⁽⁴⁾ This was also observed in the case in hand, which improved

her foot progression angle from above 70 degrees to 20 degrees.

We are reporting here bilateral osteotomy of both pubic and ischial rami (SMS osteotomy) with soft tissue release that allowed a sustainable approximation of the symphysis and protect the repair of the bladder and abdominal wall in 11-year-old patient with three recurrences. It may be useful in similar cases especially in older patients.

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