






Triple nonunion after steel-like triple pelvic osteotomy

Steel benzeri üçlü pelvik osteotomi sonrası üçlü kaynamama

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ABSTRACT

Triple pelvic osteotomy (TPO) is a widely known and accepted procedure carried out to treat acetabular dysplasia in adults. According to this technique, osteotomies are performed through the ischium, ilium and pubis in order to mobilize the whole acetabulum. In this article, we report a 30-year-old female patient who was admitted to our outpatient clinic with a complaint of intense pain after standing or walking. Patient had undergone Steel-like TPO for acetabular dysplasia approximately nine months before. After physical and radiological evaluation, patient was diagnosed with triple nonunion. Patient was successfully treated with debridement and grafting at iliac nonunion site followed by refixation with reconstruction plate and screws. A review of the literature did not detect any published studies or case reports regarding symptomatic triple nonunion after TPO using Steel-like method.

Keywords: Complication; nonunion; osteotomy; pelvic; pseudoarthrosis; triple.

ÖZ

Üçlü pelvik osteotomi (ÜPO) erişkinlerde asetabüler displazisini tedavi etmek için gerçekleştirilen, bilinen ve kabul edilmiş bir işlemdir. Bu tekniğe göre, tüm asetabulumun mobilize edilmesi için osteotomiler iskiyum, ilium ve pubisten yapılır. Bu yazıda, ayakta durma veya yürüme sonrası şiddetli ağrı yakınması ile polikliniğimize başvuran 30 yaşında bir kadın hasta bildirildi. Hasta yaklaşık dokuz ay önce asetabüler displazi nedeniyle Steel benzeri ÜPO geçirmişti. Fiziksel ve radyolojik değerlendirme sonrasında, hastaya üçlü kaynamama tanısı konuldu. İliumdaki kaynamama bölgesinde debridman ve greftleme sonrası rekonstrüksiyon plağı ve vidalarla yeniden sabitleme yoluyla hasta başarıyla tedavi edildi. Literatür incelemesinde Steel benzeri yöntem kullanılan ÜPO sonrası semptomatik üçlü kaynamama hakkında yayınlanmış çalışma veya olgu sunumu saptanmadı.

Anahtar sözcükler: Komplikasyon; kaynamama; osteotomi; pelvik; psödoartroz; üçlü.

Triple pelvic osteotomy (TPO) was initially described by Le Couer in 1965, and afterwards modified by Steel and Tönnis, respectively.^[1-3] Triple pelvic osteotomy is a widely known and accepted procedure carried out to treat acetabular dysplasia in adults.^[4] According to this technique, osteotomies are performed through the ischium, ilium and pubis in order to mobilize the whole acetabulum. It is known that these osteotomies may create a potentially unstable hemipelvis causing possible pseudoarthrosis.^[5] To our knowledge, no studies have been published

in the literature regarding the overall incidence of nonunion after TPO. Pseudoarthrosis after TPO may develop at one or more osteotomy sites, and the most undesirable scenario is a "triple nonunion", which can be a catastrophic complication.^[5] A review of the literature revealed no published studies or case reports regarding symptomatic triple nonunion after TPO. Since the management for triple nonunion is obviously challenging both for the surgeon and the patient, we aim to raise awareness among orthopedic surgeons about this serious complication.^[6] In this

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article, we present the case report of a 30-year-old female patient who underwent TPO procedure for acetabular dysplasia (Figure 1). Patient had symptomatic triple pseudoarthrosis presenting with both iliac, pubic and ischial nonunion. She was successfully treated with debridement and grafting at iliac nonunion site followed by refixation with reconstruction plate and screws.

CASE REPORT

A 30-year-old female patient was admitted to our outpatient clinic with a major complaint of intense pain after standing or walking. She had undergone Steel-like TPO for acetabular dysplasia approximately nine months before.^[1] The pain involved the pelvic and gluteal areas, worsened with physical activity and

was characteristically diffuse. Patient stated that it felt different from the groin pain she had experienced before the initial surgery. She was a non-smoker and did not have any accompanying disease. A written informed consent was obtained from the patient.

Following a thorough physical examination and radiological evaluation, patient was diagnosed with triple nonunion after TPO (Figures 2, 3, and 4). Before revision surgery, Harris hip score (HHS) of the patient was assessed and found to be 40 (poor).^[7] Radiological assessment before surgery comprised standard anteroposterior, iliac oblique and obturator oblique views. Additional computed tomography (CT) scans were obtained prior to revision surgery. After extensive evaluation and informing the patient about possible complications, a decision was established to carry out revision surgery. At this point, we decided to fix only the iliac nonunion site since patients with double nonunion of pubic and ischial bones were mostly asymptomatic according to previous reports.^[8]

The surgery was completed under general anesthesia in the supine position. The nonunion site at the ilium was exposed through the ilioinguinal approach (Figure 5). Then, four 3.5 mm cortical screws were removed from the nonunion site. The fibrotic tissue was excised whilst taking care to avoid any damage of the nerves and both vessels. An autologous block of iliac crest bone graft was

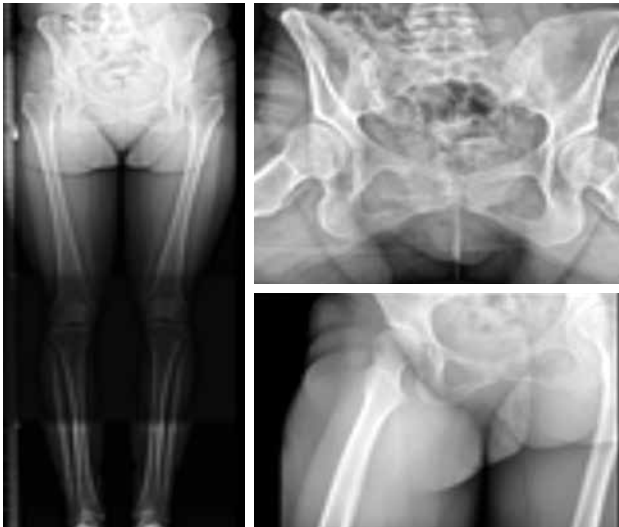


Figure 1. Plain radiographs prior to triple osteotomy (telemetric view, anteroposterior in abduction, lateral view).



Figure 2. Preoperative plain radiograph (pelvis anteroposterior view).



Figure 3. Preoperative plain radiograph (iliac oblique view).



Figure 4. Preoperative plain radiograph (obturator oblique view).

harvested from the same side and interposed to the pseudoarthrosis site. Afterwards, nonunion at the ilium was reduced and fixed with two reconstruction plates and screws (Figure 6). Early postoperative plain radiographs showed good bony contact at the fixation site; moreover, early postoperative CT scans verified correct positioning of the screws without any interference to the hip joint.

The patient remained on bed rest for three weeks until the wound healed; afterwards, non-weight bearing mobilization was allowed for eight weeks. At third month follow-up, after radiological evidence of bony union was confirmed, weight-bearing was gradually increased to full load.

The patient was followed-up for six months. At the most recent follow-up, she was able to walk without any pain, and hip range-of-motion at the affected site was normal. The final HHS was improved from 40 (poor) to 80 (good) and recent radiographs which were obtained at sixth month follow-up showed good healing at previous nonunion site (Figures 7, 8, and 9).

DISCUSSION

To our knowledge, the recent literature contains no information regarding the incidence of symptomatic triple nonunion after TPO.^[5,8] Triple pelvic osteotomy mainly aims to achieve good containment of the femoral head and stability of the hip joint; thus, it

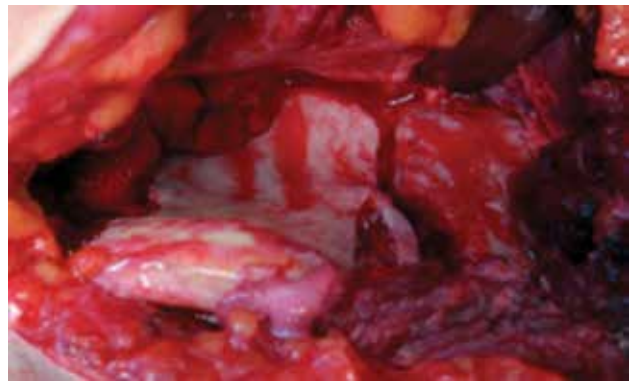


Figure 5. Pseudoarthrosis site (intraoperative view).



Figure 6. Stabilization after debridement (intraoperative view).



Figure 7. Six months after revision surgery (pelvis anteroposterior view).



Figure 8. Six months after revision surgery (obturator oblique view).



Figure 9. Six months after revision surgery (iliac oblique view).

is widely used for management of developmental dysplasia of the hip.^[9] Pauwels, in 1965, reported that functional anatomical evidence suggests that while sitting load is vertically transferred from the ischial tuberosity to the sacroiliac joint; subsequently, vertical compressive forces from the ischial tuberosity cause shear forces at the ischial osteotomy site, at which point routine fixation is not applied in TPO.^[10] In addition, forces that act on the symphysis pubis can deform the inferior pubic ramus. These, in combination, lead to micromovement at pubic and ischial osteotomy sites which may cause nonunion. This potential risk of nonunion in TPO can be eliminated, theoretically, by Bernese periacetabular osteotomy which is carried out by leaving the posterior column intact.^[11]

A review of the literature demonstrated conflicting reports regarding the fixation of nonunion sites. Tschauner et al.^[5] emphasized that it is important to fix ischial site for biomechanical reasons, and Vukasinovic et al.,^[8] in a large series of TPO patients, reported that double nonunions involving pubic and ischial bones were asymptomatic. After a review of the literature, we decided to fix only the iliac site in order to avoid additional operating time and morbidity. Both the satisfaction of the patient and good clinical outcome corroborated our decision.

Pre-revision radiographs revealed that the patient had triple osteotomy, involving a modification of

Steel's technique.^[1-3] We assume that the surgeon conducted ischial osteotomy closer to the acetabulum compared to Steel's triple osteotomy (adjacent to the hip joint) to allow an easier rotation of the acetabulum.^[9]

Steel^[1] reported no incidence of nonunion in their original article whereas Tönnis et al.^[2] reported one patient with pseudoarthrosis of the pubic ramus in their own series. A study by Tschauner et al.,^[5] comprising 409 TPOs using the Tönnis technique, reported five cases of double nonunion, but no triple nonunion.

Vukasinovic et al.^[8] stated that triple nonunion may develop due to excessive acetabular dislocation, incorrectly modelled bone graft and poor contact between cortices. They performed a modification of the Tönnis technique which consists of a more comfortable surgical approach with two incisions instead of three. In their published series, they reported five female patients with painful double-nonunion and one triple nonunion patient who did not have any symptoms and treatment.^[8] Contrary to their report, our triple nonunion patient had serious pain when walking and standing; thus, we think that triple nonunion is a painful and serious complication which should be regularly treated. It would not be unusual for triple nonunion, which involves iliac, pubic and ischial bones, to be significantly more

painful than a double nonunion since it causes a more “unstable” pelvis. To the best of our knowledge, this is the first report of symptomatic triple nonunion following Steel-like TPO.

Tschauner et al.^[5] underlined the low revision rate of TPO; however, they recommend that adequate bony contact should be ensured at all osteotomy sites, the iliac osteotomy site should be stabilized properly and a long mediolateral screw should be used for stabilization in the existence of poor bony contact at the pubic osteotomy site. In contrast to these aforementioned recommendations, initial radiographs of our patient, prior to revision surgery, revealed lack of sufficient bony contact at all osteotomy sites. We attribute this condition to over-mobilization of the acetabulum. Besides, during the procedure, we noticed that efficient compression at osteotomy sites could not be achieved with the present osteosynthesis.

We suggest that over-mobilization of the acetabulum in TPO may cause poor bony contact in the ischium, pubis or ilium and eventual pseudoarthrosis. Orthopedic surgeons should take necessary precautions to avoid failure of osteosynthesis and subsequent pseudoarthrosis. A major pitfall during surgery is to treat nonunion of the ilium while preserving acetabular rotation and containment.^[12] Thus, we recommend the measuring of the center-edge angle before and after surgery to avoid this dilemma.

This case is an example of a unique but devastating complication of TPO: a symptomatic triple nonunion. We aim to emphasize that, in triple nonunion after TPO, a solo fixation of iliac nonunion site can successfully improve the symptoms and achieve good clinical outcome. Although TPO is considered to be a safe procedure,^[8] orthopedic surgeons should bear in mind various serious complications that may occur when certain basic recommendations are not followed.

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