

Minimally invasive (MIS) Tönnis osteotomy– A technical annotation and review of short term results



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ARTICLE INFO

Keywords:

Minimally invasive Tönnis osteotomy
Dysplasia
Sheffield approach

ABSTRACT

Aims: We detail a modified single incision approach to perform the Tönnis triple pelvic osteotomy by a minimally invasive approach.

Patients and Methods: 12 children underwent minimally invasive Tönnis Osteotomy. There were five boys and seven girls in this study group. Average age was 11 years (9–15 years) at the time of surgery. Mean follow-up was 20.5 months (13–39 months).

Results: The average preoperative Antero-Posterior (AP) Centre Edge (CE) angle was -8.8° (-38.6° – 18°), the average post-operative AP CE angle was 29.7° (25.1° – 43.7°). The average preoperative lateral CE angle was -4.7° (-16° – 0°), the average postoperative Lateral CE angle was 28.5° (21.3° – 37.4°). The Sharp's angle before and after surgery were 55.7° (51.3° – 66°) and 32.4° (16.1° – 40.1°) respectively. The mean Tönnis angle before and after the osteotomy were 28.86° (19.7° – 43.4°) and 6.3° (0.5° – 9.4°) respectively. There was one major complication with sciatic nerve palsy which is in the recovery phase on followup and six minor complications including two cases of transient lateral femoral cutaneous nerve injury, two cases of ischial non-union, over granulation of the wound in one case, and metalwork irritation in one case.

Conclusion: We have described a minimally invasive Tönnis osteotomy as a viable option based on our results. This technique is recommended for those who are conversant with the traditional pelvicosteotomies.

1. Introduction

Triple pelvic osteotomy has been a key technique for correction of acetabular dysplasia. First described by Le Coeur in 1965, it has since undergone multiple modifications and refinements.¹ A common feature of the early techniques is that they described osteotomies of the pubic ramus and ischium far away from the acetabulum, thereby restricting the fragment mobility. It was Tönnis and Carlöz who demonstrated that the juxta-acetabular ischial cut could untether the acetabular fragment from the tight grasp of sacrospinous and sacrotuberous ligaments, resulting in greater mobility of the acetabular fragment.²

The original modification by Tönnis used three separate approaches; one for each individual osteotomy.² However the literature is replete with various modifications of this approach.^{3–7} Most of the techniques involved a posterior or groin incision to perform the ischial cut. Inspired by the Bernese approach to the Peri-Acetabular osteotomy, Zaltz described the single incision triple pelvic osteotomy with the ischial cut passing through the lesser sciatic notch, however this does not prevent tethering of the acetabulum by the sacrospinous ligament.^{8,9}

We describe a minimally invasive Tönnis osteotomy by the Sheffield approach, in which the ischial cut is performed above the ischial spine through a single anterior incision. The sacrospinous ligament is not attached to the fragment thereby facilitating its maximum mobility. Furthermore, all osteotomies are performed through a single approach, obviating the need for patient repositioning during the procedure. We intend to share our experience with this approach for the management of acetabular dysplasia in children.

2. Material and methods

2.1. Outcome assessment

A search in the hospital database for pelvic osteotomies performed between 2006 and 2015 retrieved 320 cases. Of these, 12 patients had undergone minimally invasive Tönnis osteotomy and formed the study group. Those who underwent the traditional two-incision approach were excluded. This study was approved by the institutional audit and ethical committee. The inclusion criteria were symptomatic dysplasia in

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patients who underwent minimally invasive Tönnis osteotomy by the Sheffield approach, no evidence of osteoarthritis (Tönnis 0 or 1), good range of motion in the hip joint.

Case notes were reviewed to collect demographic details, indications for surgery and perioperative data including operative time, blood loss and postoperative transfusion requirements. All patients/carers completed self-assessment functional questionnaires including the Modified Harris Hip Score (MHHS) and the Non-Arthritic Hip Score (NAHS) preoperatively and again before last follow-up. The radiographs were retrieved from the Picture Archival and Communication Systems (PACS).

Analysis was performed of pre and postoperative radiographs to assess the extent of dysplasia. Antero-posterior (AP) and false profile pelvic radiographs were reviewed to measure the centre edge angle (CE), Sharp's angle and the Tönnis angle. Paired T test was used to check the differences observed and significance was set at p value ≤ 0.05

2.2. Surgical technique

All operations were performed by the senior author (SSM), involving a technique similar to that of the minimally invasive Periacetabular Osteotomy (PAO) described by Troelsen et al ¹⁰.

Patients are positioned supine on a special Macquet radiolucent attachment to the operating table. Preoperative image intensifier screening of the operative hip is performed to obtain baseline AP and false profile views (Figs. 1 and 2). Effective planning, positioning of the image intensifier and communication with the radiographer is key to ensure required views can be easily obtained during surgery and thereby reduce unnecessary radiation exposure and time loss.

Sterile preparation of the entire lower limb from subcostal region to the foot is done. A lumbar plexus block is performed preoperatively for the majority of cases. This helps the patients postoperatively, particularly in children with spasticity. The entire lower limb is then prepared and draped extending proximally to the subcostal region. A 5–7 cm incision centered on the anterior superior iliac spine is made with 3 cm below and 4 cm above it in the groin crease (Fig. 3a and b). The sartorius and tensor fascia lata interval is identified and the lateral femoral cutaneous nerve identified and retracted medially. The muscles on the inner table of the ilium are elevated subperiosteally with a sharp periosteal elevator up to the pelvic brim, and distally with a Cobb's elevator to the quadrilateral plate. The medial soft tissues are retracted with a curved radiolucent blunt Hohmann retractor.



Fig. 1. Pre-operative AP view of a hip [with open triradiate cartilage] on table screening.



Fig. 2. Pre-operative false profile view of a hip [with open triradiate cartilage] on table screening.

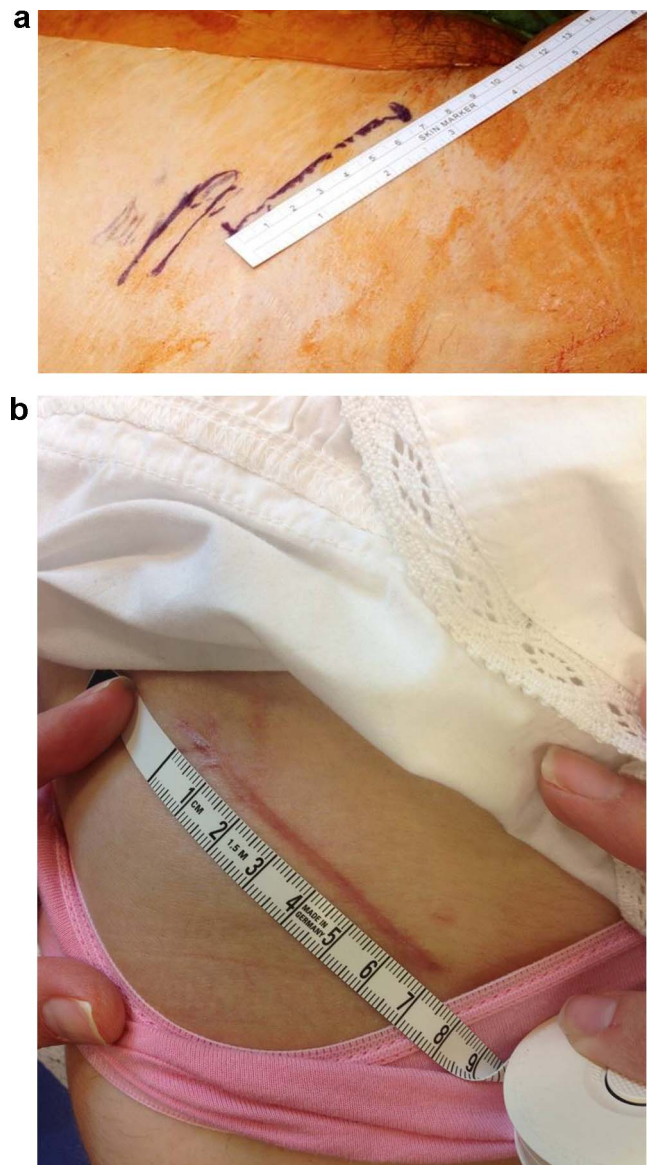


Fig. 3. (a) On-table marking of the skin incision for MIS Tönnis osteotomy. (b) Follow-up clinical picture to demonstrate the scar.

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