Journal of Clinical Orthopaedics and Trauma xxx (2017) xxx–xxx

Contents lists available at ScienceDirect

Journal of Clinical Orthopaedics and Trauma

journal homepage: www.elsevier.com/locate/jcot

Full length article

# Minimally invasive plate osteosynthesis on anterior pelvic ring injury and anterior column acetabular fracture

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ARTICLE INFO

*Article history:*
Received 13 February 2017
Received in revised form 13 May 2017
Accepted 3 June 2017
Available online xxx

*Keywords:*
MIPO
Modified stoppa and lateral window
Pelvic fracture
Anterior column
Acetabular fracture

ABSTRACT

*Introduction:* In performing surgery for fractures of the pelvis and acetabulum, various surgical approaches have been introduced with their own advantages and drawbacks. The extensile nature of ilioinguinal approach gives excellent exposure but was related to wound healing problems. Modified stoppa has a higher difficulty and poses a risk for neurovascular injury. In this study, we elaborate our experience using the Modified Stoppa approach with additional lateral window while adding few modifications to simplify the procedure and facilitate future implant removal.
*Methods:* A prospective-retrospective cohort involving 30 anterior pelvic ring and/or anterior column acetabulum fracture patients were conducted from 2012-2016. Fifteen cases were prospectively treated using the modified approach since 2014, while the remaining fifteen cases that were treated using Ilioinguinal approach were retrospectively reviewed. Intraoperative parameters such as blood loss, duration of surgery, quality of reduction (Matta) and postoperative functional outcome (Majeed and Hannover score) at 12 months period were recorded and evaluated by a blinded reviewer.
*Result:* There were no significant differences between the two groups in mean age, sex and fracture type. The mean blood loss in the MIPO group were $325 \pm 225$ mL versus $710.67 \pm 384.51$ mL in the control group ($p = 0.002$). Duration of surgery were $149.33 \pm 91.92$ minutes in MIPO group versus $235.71 \pm 65.79$ minutes in ilioinguinal group ($p = 0.014$). There were no significant differences noted between the two groups in the quality of reduction and postoperative functional outcome, either by using Majeed or Hannover pelvic score. No complications were found after a 12-months follow up period. Two modified cases already had their implant removed and during the procedure, fibrotic tissue were minimal making the implant removal was less complicated and easier.
*Conclusions:* Modified stoppa and lateral window technique can be used as a safe and effective alternative approach for anterior pelvic ring fracture and/or anterior column acetabulum fracture. This approach decreased the duration of surgery and blood loss without compromising the quality of reduction and functional outcome in patients.

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## 1. Introduction

Definitive surgical management of pelvic and acetabulum fracture has been revolutionized by Letournel in 1961. The introduction of Ilioinguinal approach has allowed surgeons to perform anatomical reduction with adequate visualization of the fracture fragments by exposing the inner surface of the pelvis from the anterior aspect of sacroiliac joint to the pubic symphisis.[1,2] The extensive exposure of ilioinguinal approach provides an excellent visualization of the fracture but is associated with several morbidities and wound healing problems. The need for detaching the anterior abdominal muscle groups and fascia from the ilium along the inguinal canal, may contribute to this problem as well. Related complications such as postoperative wound infections and inguinal hernia have been reported.[1–4] Dissections around the femoral and lymphatic vessels in the attempt to open the second window is also associated with some reported complications such as interruption of the lymphatic system causing limb edema, arterial thrombosis (femoral and inferior epigastric) and femoral nerve injury.[4–6] Postoperative tissue fibrosis in the middle window is a major problem in implant removal, thus it is generally recommended that the plate be left insitu indefinitely.[7] This may present a concern in several countries where cultural beliefs dictate that the implant should be removed.

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http://dx.doi.org/10.1016/j.jcot.2017.06.007
0976-5662/© 2017

Please cite this article in press as: H.D. Ismail, et al., Minimally invasive plate osteosynthesis on anterior pelvic ring injury and anterior column acetabular fracture, J Clin Orthop Trauma (2017), http://dx.doi.org/10.1016/j.jcot.2017.06.007

Modifed Stoppa intrapelvic approach for acetabular fracture was introduced by Cole and Bofhofner in 1994. Despite being a less invasive approach, it provides a good visualization of the medial wall of the acetabulum, quadrilateral surface and sacroiliac joint.[8,9] Despite these advantages, this approach is technically more demanding and requires identification and ligation of corona mortis to prevent excessive bleeding intraoperatively. Neurovascular injuries such as obturator nerve palsy and superior gluteal artery injury have also been reported.[10] Post operative fibrosis of the internal surface of the pelvis also hinders the possibility of implant removal using this approach.

In the past decade, several minimally invasive approaches have been proposed, either by modifying the Ilioinguinal approach or by adding a lateral window to the original modified Stoppa approach. In this paper, we would like to elaborate our personal experience using the Modified Stoppa approach with an additional lateral window in treating anterior pelvic ring injury and anterior column acetabular fracture, while adding a few modifications to simplify

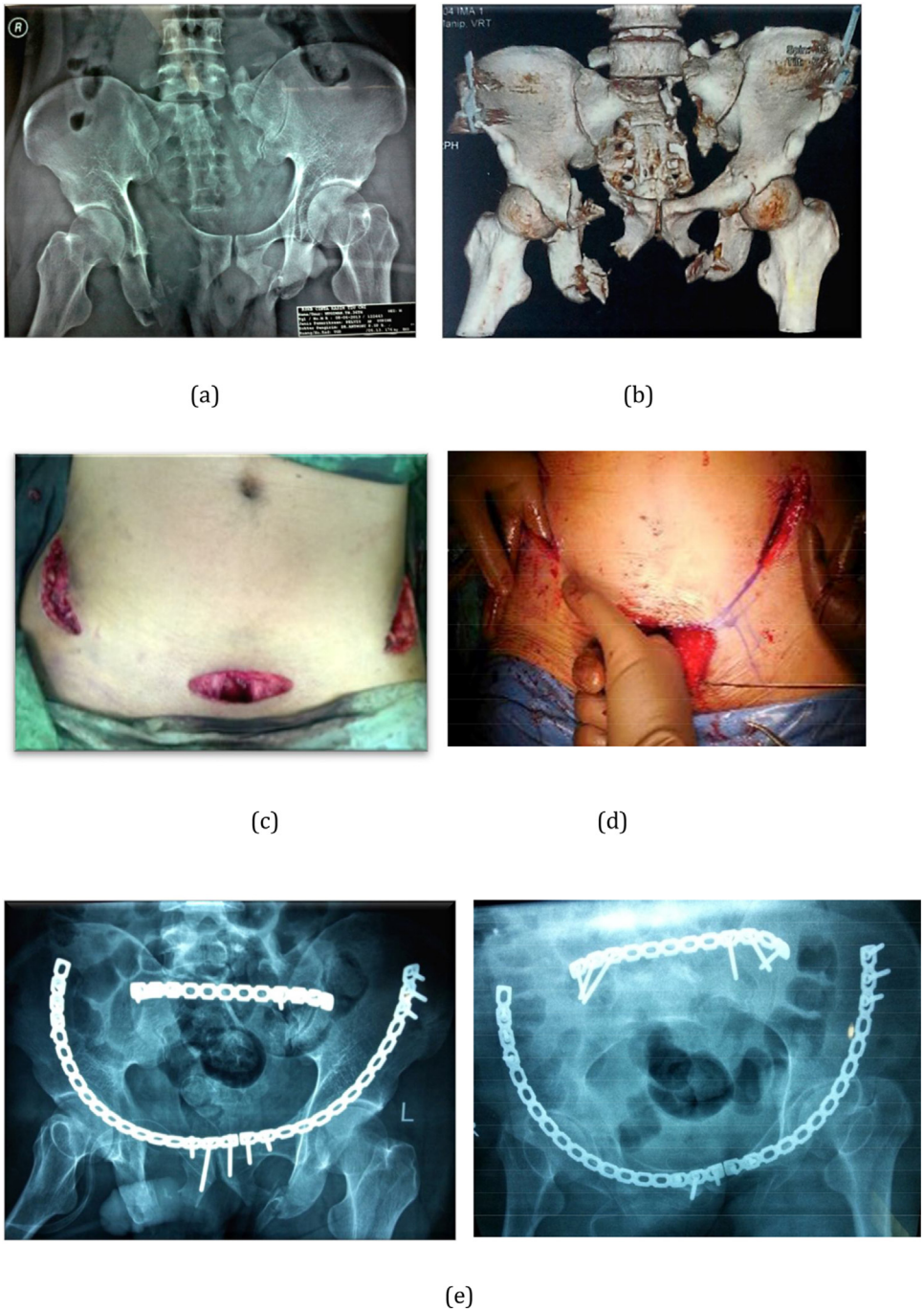


**Fig. 1.** A 36 years old male with unstable pelvic fracture, MT C3 Type right anterior column (a) Preoperative anteroposterior pelvic radiograph showing fracture of right superior and inferior pubic rami, left anterior column acetabular fracture, left sacral fracture and vertical instability of left hemipelvis; (b) 3D reconstruction CT Scan showing clearer image of the fracture pattern. (c) Modified Stoppa and lateral ilioinguinal approach, showing the extent of incision while leaving the second (middle) window intact; (d) Blunt finger dissection subperiosteally connecting the tunnel from both incisions; (e) postoperative anteroposterior pelvic radiograph showing satisfactory reduction of pelvic fracture and anatomical reduction of left anterior acetabular column.

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