Injury, Int. J. Care Injured 46S (2015) S78–S86

Contents lists available at ScienceDirect

Injury

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

Rationale for more consistent choice of surgical approaches for acetabular fractures

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ARTICLE INFO

Keywords:
Acetabular fractures
Both-column fracture
T-type fractures
Surgical approaches
Surgical treatment
Treatment algorithms

ABSTRACT

Objectives: All acetabular fractures are difficult to treat surgically, but there are four types involving two columns that are particularly challenging. The choice of surgical approach is crucial. The purpose of the study was to determine and evaluate the factors influencing the choice of surgical approach for two-column acetabular fractures. We hypothesised that more accurate preoperative planning, sophisticated technical capabilities, and evolution of surgeon experience will result in more consistent use of non-extensile single surgical approaches. We also evaluated the outcomes of surgical treatment and the correlation with the surgical approach used.
Design: Retrospective cohort study.
Patients and methods: A total of 156 patients with 157 acetabular fractures involving two columns (Letournel T-types and both-column) treated surgically in a 25-year period (1988–2013) were included in the study. The acetabular fractures in this study were divided into two groups according to the date of surgery: 81 in Group 1 (1998–2002) and 76 in Group 2 (2003–2013). All fractures were classified preoperatively according to the Judet and Letournel classification system and Matta's categorisation of surgical approach. Four surgical approaches were used: single Kocher–Langenbeck (KL), single ilioinguinal (II), combined Kocher–Langenbeck and ilioinguinal (KL + II), and extended iliofemoral (EIF). The efficacy of the surgical approach utilised was assessed using three parameters: anatomical reduction, surgical time and intraoperative complications.
Results: There was no statistical difference between Group 1 and Group 2 in the distribution of T-type ($p = 0.424$) and both-column ($p = 0.425$) fractures. In Group 2 more acetabular fractures were treated through single non-extensile approaches compared with Group 1 (90.8% vs. 54.3%, $p < 0.001$). Increase in single approach surgery resulted in shorter mean surgical time ($p < 0.001$) and significant increase in anatomical reduction ($p = 0.039$). The frequency of intraoperative complications was not statistically different ($p = 0.07$) between the two groups, but there was a trend to fewer complications in Group 2.
Conclusions: The surgical approaches chosen for acetabular fractures that involve two columns (Letournel T-types and both-column) should become more consistent. The results of this study indicate that the majority of such acetabular fractures can be treated successfully through single surgical approaches.

Introduction

Accurate classification of acetabular fractures is vital when choosing the correct surgical approach to enable the most effective surgical treatment. The anatomy of the acetabulum is complex and various classification systems have been proposed, most of which are based on the anatomical concept that the acetabulum is composed of two columns. One such system is the Judet–Letournel classification system, which is the most widely accepted today [1,2]. Although all existing classification systems can be used to provide general guidelines for the selection of the correct surgical approach, Matta [3] indicated that none of these systems gives

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http://dx.doi.org/10.1016/j.injury.2015.10.045
0020–1383/

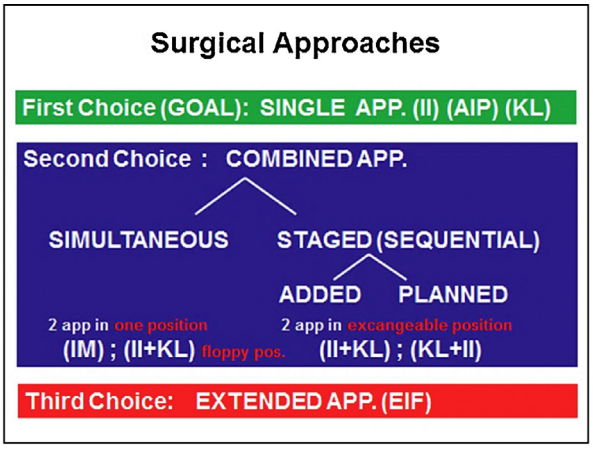
accurate guidelines, particularly for the four types of acetabular fracture that involve two columns (T-type and both-column). These fractures are common; therefore, it is particularly important for surgeons to be able to choose the most appropriate surgical approach.

The choice of surgical approach is generally primarily dictated by the type of acetabular fracture and by the requirements for reduction. For a single column fracture and/or single acetabular wall fractures, the decision is relatively simple, but the choice of the most appropriate surgical approach becomes challenging when both columns are affected, particularly when they involve acetabular wall fractures [4–6]. In addition to fracture morphology, the selection of the surgical approach depends on the degree of dislocation, associated injuries, time elapsed since trauma, patient age, condition of the skin on the site of approach, and surgeon experience [2–6].

Judet and Letournel emphasise a significant correlation between the success of surgery and proper determination of the type of acetabular fracture according to preoperative X-rays [2]. The Judet and Letournel classification system includes the following types of acetabular fracture: (a) five simple or elementary fractures, (b) five associated fractures and (c) some special types of acetabular fracture that could be classified only as transitional fractures [2].

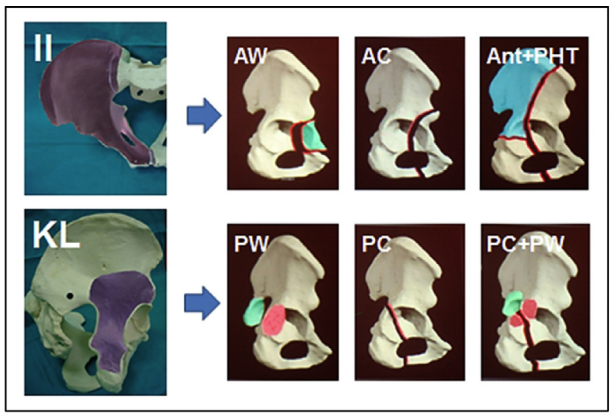
Letournel recommended single non-extensile approaches for simple acetabular fractures [2]. He observed that the entire reduction could be performed using one approach in these fracture types (Fig. 1). In cases when two columns are affected or the degree of joint incongruence is significant, a different surgical tactic could be considered: combined anterior and posterior approach or extended approaches, such as the extended iliofemoral (EIF) approach [5] (Fig. 1). Some authors prefer extensile approaches that can really achieve a wide exposure of acetabulum and both columns. However, such approaches result in an increased number of complications: increased blood loss, extended surgical time, heterotopic ossifications, infection, abductor weakness, deep haematoma, delayed union, avascular necrosis of bony fragments, and posterior gluteal muscle necrosis [7,8].

Other authors suggest non-extensile single surgical approaches for two-column fractures. In certain situations single surgical approaches cannot provide adequate visualisation and reduction of the fracture. In such cases additional surgical techniques and a wide variety of specialised reduction tools should be used to improve visualisation and reduction of fractures. "Flip" or traditional trochanteric osteotomy, "T" anterior extension or



(II=ilioinguinal, AIP=anterior intrapelvic, KL=Kocher Langenbeck, IM=iliomedial, EIF=extended iliofemoral)

Fig. 1. Choice of surgical approach for acetabular fractures.



(II=Ilioinguinal, KL=Kocher Langenbeck, AW=anterior wall, AC=anterior column, Ant+PHT=anterior+posterior hemitransverum, PW=posterior wall, PC=posterior column, PC+PW=posterior column+posterior wall)

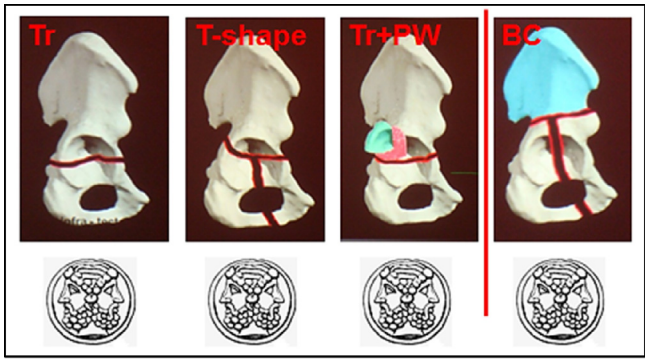
Fig. 2. Acetabular fractures with consistent surgical approach.

digastric slide osteotomy, with or without hip dislocation, could be preformed to enable indirect reduction [9–20].

According to the Judet and Letournel [21] classification system, Matta [3] proposed a consistent surgical approach for six of ten acetabular fractures (Fig. 2): the ilioinguinal (II) approach for anterior wall (AW), anterior column (AC), and anterior column + -posterior hemitransverse fractures (AC + PHT); and the Kocher–Langenbeck (KL) approach for posterior wall (PW), posterior column (PC), and posterior column + posterior wall fractures (PC + PW). The surgical approach for the four remaining fracture types, transverse fractures (Tr), transverse + posterior wall fractures (Tr + PW), T-shape fractures and both-column fractures (BC) was not consistent and should be chosen according to the specific fracture pattern (Fig. 3) [3]. For these acetabular fractures, the surgical approach must be individualised according to the fracture pattern and surgeon experience [3]. Surgical approaches for such fractures are inconsistent and in their ambiguity resemble God Janus, a mythical creature with two heads (Fig. 3).

Surgical approaches to acetabular fractures could be divided and classified as represented in Fig. 4.

There is no consensus regarding the appropriate surgical approach for transverse fractures (Tr), transverse + posterior wall fractures (Tr + PW), T-shape fractures and both-column fractures (BC), and there have been no studies with that intention. This study was conducted to evaluate the results of 25 years of experience with the aim to recommend a more consistent surgical approach to these types of acetabular fracture.



(Tr=transverse, Tr+PW=transverse+posterior wall, BC=both column)

Fig. 3. Acetabular fractures with inconsistent surgical approach, resembling the Roman god Janus, a god with two faces.