

The Iliinguinal Approach versus the Anterior Intrapelvic Approach to the Acetabulum: A Review

Ilir Hasani^{*}, Igor Kaftandziev, Simon Trpeski, Ljupco Nikolov, Alek Saveski, Gjorgji Velkovski

University Clinic for Traumatology, Faculty of Medicine, Ss. Cyril and Methodius University of Skopje, Republic of Macedonia

Abstract

Citation: Hasani I, Kaftandziev I, Trpeski S, Nikolov Lj, Saveski A, Velkovski Gj. The Iliinguinal Approach versus the Anterior Intrapelvic Approach to the Acetabulum: A Review. *OA Maced J Med Sci*. 2013 Dec 15; 1(1):140-147.
<http://dx.doi.org/10.3889/oamjms.2013.027>

Key words: acetabulum; anterior intrapelvic approach; Stoppa approach; modification of Stoppa approach; minimally invasive anterior approach to the acetabulum; review.

***Correspondence:** Ilir Hasani, MD. University Clinic for Traumatology, Faculty of Medicine, Ss. Cyril and Methodius University of Skopje, Vodnjanska 17, Skopje, Republic of Macedonia Tel.: +389 7023 6680. E-mail address: ilirku@yahoo.com

Received: 17-Oct-2013; **Revised:** 14-Nov-2013; **Accepted:** 15-Nov-2013; **Online first:** 27-Nov-2013

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Competing Interests: The authors have declared that no competing interests exist.

The ilioinguinal approach (IIA) to the acetabulum has been used as a golden standard for fifty years to treat "anterior" acetabular fractures. Since its introduction by Hirvensalo and Cole, the anterior intrapelvic approach (AIPA) has been adopted by some surgeons, whilst others remain devoted to the IIA. IIA is routinely used in the Republic of Macedonia. The aim of this study is to present a review of literature for two different anterior approaches for the treatment of acetabular fractures used in modern day surgery, focussing on AIPA and its priorities and comparing it to IIA.

We performed a search, mainly electronically, and retrospective analysis of existing literature. We have identified and selected two representative and well-systematized papers for IIA, and six for AIPA.

We presented the advantages and disadvantages, priorities and weaknesses of both approaches separately, comparing complications, risks and results.

Based on the facts presented regarding the advantages of AIPA with a focus on visualization, accessibility and biomechanical justification, the approach should be implemented in our everyday practice and we are comfortable in stating this preference, especially due to the fact that upon comparison of the complication rate there is no significant difference between the two approaches.

Introduction

Acetabular fractures are rare fractures with an annual incidence of three patients per 100, 000 inhabitants [1]. They mainly affect the younger population, with a male predominance of approximately 70-75% [1, 2], although there is a trend of increasing incidence in the elderly patients group [2-5] proportional to the rise in the average age of the population worldwide [4, 5] and also a slight but noticeable increase over time in the incidence among women [1]. The most common mechanism of injury is high-energy trauma associated mostly with motor vehicle accidents in the younger population, while the main reason for osteoporotic acetabular fractures in elderly patients is a ground-level fall associated with a low-energy mechanism of injury [5].

Acetabular fracture within the younger population group is associated mainly with high-energy trauma. There are two main directions of force that, when applied to the hip, can cause an acetabular fracture: forces parallel to the diaphysis of the femur and forces acting on the greater trochanter and which are parallel to the femoral neck [6, 7]. The fracture pattern is directly associated with the degree of flexion of the hip, the degree of rotation of the femoral neck and unquestionably the direction and amount of energy that is delivered to the hip during the injury [6, 7]. According to Letournel and Judet's original work [7, 8], first described in 1960 then followed by a series of modifications before finally being published in 1965, acetabular fractures are classified into two main groups (elementary and complex) and five subgroups within each group.

Table 1: Letournel's original classification of acetabular fractures [9].

Elementary fracture types	Associated fracture types
Posterior wall	Posterior column/wall
Posterior column	Transverse/posterior wall
Anterior wall	T-type
Anterior column	Anterior fracture/posterior hemitransverse
Transverse	Both columns

This was included in Tile's comprehensive classification [10], which has been accepted by the AO Classification of Fractures.

Table 2: Comprehensive classification system integrating the principles of Letournel's classification [10].

<i>Type A Partial articular, involving only one of the two columns</i>	
A1: Posterior wall fracture	
A2: Posterior column fracture	
A3: Anterior wall or column fracture	
<i>Type B Partial articular, involving a transverse component</i>	
B1: Pure transverse fractures	
B2: T-shaped fractures	
B3: Anterior column and posterior hemitransverse	
<i>Type C Complete articular fractures, both columns</i>	
C1: High variety, extending to the iliac crest	
C2: Low variety, extending to the anterior border of the ilium	
C3: Extension into the sacroiliac joint	

Acetabular fractures related to high-energy trauma are very often followed by other injuries of the trunk [1, 2, 6], mainly a head injury (in almost 50% of cases), but also limb injury, chest, genitourinary and spinal injury respectively [2]. They are sometimes also related to pelvic fractures, referred to in literature as a "devastating dyad" [11].

The most common fracture patterns in the elderly are fracture displacements of the anterior structures (both column fractures, anterior column, anterior with posterior hemitransverse [12], anterior wall). The most characteristic features of the fractures in the elderly population are roof impaction and involvement of the quadrilateral lamina [13] and also, but not as frequently, damage to the femoral head and hip dislocation [2]. They are very challenging in terms of treatment. High-energy trauma is responsible for 44% of cases of acetabular fractures in the elderly population group, with fracture patterns similar to those of the young [5]. During the 1960s, operating on these fractures was contraindicated. However, with modern advances in acetabular surgery, and considering the fact that insufficient fixation leads to non-union and that insufficient reduction increases the possibility of early arthrosis, it is absolutely preferable and also useful to operate on these fractures in order to prevent non-unions and early arthrosis [12].

Depending on the approach used in treating acetabular fractures, they can be classified as fractures requiring anterior approaches (fractures with a main displacement in the anterior structures), fractures that can be treated with posterior approaches (fractures with a main displacement in the

posterior structures) and also fracture patterns requiring combined or extensive approaches (fractures with a wide displacement in both structures) [6].

The focus of our review is on the fractures that can be treated with anterior approaches and also the approaches themselves. Anterior approaches can be used to treat the following acetabular fracture patterns: anterior wall, anterior column, anterior column/wall with posterior hemitransverse, fractures of both columns and transtectal transverse fractures [6].

From a historical standpoint, there is almost one century's difference between the introduction of posterior approaches by Langenbeck in 1874 (and later Kocher, who in 1909 described the posterior approach to the hip called Kocher-Langenbeck), and the introduction of the anterior approach by Letournel in 1965 [8]. Before then, treatment was mainly conservative and only twenty cases of operative treatment of acetabular fractures have been identified. After its introduction in 1965, the ilioinguinal approach (IIA) was established as the golden standard for treating the anterior fracture patterns of acetabular fractures in both young and elderly groups of people. It has been widely accepted and implemented both in Europe and worldwide, and has been linked to very good results when practised by an experienced surgeon [6, 14-16]. Very resistant to time changes, it has survived as the golden standard for almost half a century without any modification.

Even though IIA is a universal approach, as mentioned above, there have recently been numerous publications referring to a modification of this approach [17-21]. It is a widely-accepted theory in surgery that if there are many described approaches or techniques for a condition then there are limitations or insufficiencies in that approach or technique, and so scientists are permanently searching for a better alternative.

IIA is, technically, a very demanding approach and exposure is very laborious, especially when dealing with a previously-prepared inguinal canal due to the operative treatment of groin hernias, etc. It is quite aggressive and time-consuming, and is followed by tissue damage related to access morbidity and complicated closure of the wound. It is somewhat risky since it deals with the main vascular and neural "highways" of the lower extremities. It has no access to the lamina quadrigemina and its reduction and fixation is indirect and quite complicated [6]. The posterior column is also inaccessible [22], and the "corona mortis" is very difficult to identify and ligate. Furthermore, IIA has been associated with a 10 % complication rate, which includes hernias, thrombosis, lesion of the femoral vessels, lymphoedema, haematoma and wound healing problems [23]. Even though these complications have been much rarer in the hands of experienced surgeons, there remains a

major concern of possible injuries to the neurovascular structures [21].

The above-mentioned facts have pushed surgeons to look for something better, easier, and related to fewer problems. Similar to hip replacement surgery, where during the last 2-3 decades there is a permanent tendency of making the approach smaller with less surgical dissection and less blood loss, also, in the acetabular surgery, there is a need for developing surgical techniques whilst also looking for less aggressive approaches in order to reduce access morbidity, operative time and blood loss.

Hirvensalo [24] has worked on the modification of the well-established and well-known anterior approach of Rives and Stoppa [25], used in abdominal surgery to treat large anterior wall abdominal hernias.

The modified Stoppa approach, otherwise known as the anterior intrapelvic approach (AIPA) [26] to the anterior acetabulum and pelvis through an intrapelvic dissection from the midline, was first described in 1993 by Hirvensalo [24], and later independently by Cole in 1994 [27], and has the advantage of improved access to the inner side of the innominate bone under the pelvic brim including the quadrilateral lamina. Some authors also claim that through this approach the posterior column can also be accessed [22]. It also allows for anatomical reduction and fixation to be carried out much more easily. Hirvensalo's approach immediately became a tough topic in international literature and conferences and after only a short period of time became widely accepted internationally. Although it was initially designed for elderly persons, in particular regarding the quadrilateral plate - the most complicated part to access, reduce and fix - its indication has also been extended to the younger population. Surgeons using this approach claim that there is no longer need for IIA in the treatment of "anterior fractures" of the acetabulum.

Although this approach is less invasive and has theoretical advantages compared to IIA, there is still frequently (approximately 60% of cases [26]) a need for the "first window" of IIA in order to visualize the iliac wing.

Other authors have therefore continued to search further for an alternative single approach to treat anterior fractures of the acetabulum. As an alternative to the standard approaches, there are several other papers proving other less invasive or different approaches, but there is insufficient evidence and clinical proof to demonstrate that they are superior to those of Letournel and Hirvensalo.

For example, Keel and coworkers [28] are pioneers in discovering, implementing in clinical practice, publicizing and promoting a single approach for the treatment of anterior fractures of the acetabulum, which they have named the Pararectus

approach. It is the only approach that can visualize all of the inner side of the innominate bone, including the lower part of the innominate bone under the pelvic brim, through only one window, and also the inner side of the iliac bone, through mobilizing and transpositioning the iliopsoas muscle.

The last decade was known for the implementation of navigation systems in orthopaedic trauma surgery with specific focus on spinal, pelvic and acetabular surgery [10, 29]. As we are looking to lower the operative approach, image guidance systems will help us to achieve the smallest incisions, the highest precision, reduce radiation, lower revisions and certainly achieve better functional results.

We are presenting a review of literature for two different anterior approaches for the treatment of acetabular fractures used in modern day surgery during the previous and current centuries, focussing on Hirvensalo's anterior intrapelvic approach and its priorities and comparing it to Letournel's ilioinguinal approach.

Material and Methods

During our study we mainly searched electronically in well-known databases such as PUBMED, HINARI, and the AO Foundation multi-journal search, primarily using the keywords: "approaches acetabular fractures", "anterior modified approaches acetabular fractures". We examined all articles describing anterior approaches; the classic ones such as ilioinguinal as well as modifications to them. The most important articles were those including clinical results and complication rates of the different anterior approaches, and also original articles describing new approaches, even though they are based on a small number of patients. We also consulted traditional textbooks in both Macedonian and English.

We identified six publications [22, 26, 27, 30-32] reporting a significant number of patients with fractures of the acetabulum operated using AIPA, with well-systematized complications and results, in order for a valid comparison. We also identified a number of publications reporting complications and results following IIA, but for reasons of representation we have selected only two, one of which is the largest series by the IAA author and which is presented in his work [15]. We excluded case reports, biomechanical studies, technical notes, letters to the editor and editorials. The results were presented in a table, based on the treatment method, outcome and complications.

Results and Discussion

Surgeons work towards identifying the ideal approach with minimal invasiveness, less blood loss,

shorter operative time, good visualization and manipulation, and easy and rigid fixation. Below we will present the evidence of studies comparing the complication rate, risks and results between AIPA and IIA.

Visualization and accessibility

The main advantage of AIPA compared to IIA, and which is agreed upon by almost all authors using this approach, is the wider and better manipulation field for instruments and hardware, especially in the case of a fracture in the quadrilateral surface and the posterior column. It could therefore be used as an easy alternative to IIA when operating on specific fracture patterns.

In contrast to the Kocher-Langenbeck approach, both of these anterior approaches are extra-articular as they do not visualize the joint itself and reduction is indirect. However, IIA ensure a wider view of the true pelvis and access to the pubic bone including the body and root and the following brim (iliopectineal line) of the pelvis to the anterior sacroiliac joint, the quadrilateral plate and the inner side of the posterior column.

Andersen et al., [22] presented seventeen patients treated with AIPA (or, as they call it, a “non-extensile” approach) for acetabular fractures with major anterior and posterior column dislocation. The advantage of reconstructing the posterior column (e.g. in both column fractures) through a single approach is very beneficial for the patient, since the relatively mutilating consequences of the combined approach are avoided, considering the fact that the posterior Kocher-Langenbeck approach is followed by 7% heterotopic ossification (HO), compared to IIA which is linked to less than 1% in larger series [14]. AIPA, like IIA, is related to a low rate of HO as shown in Table 4.

Patients with a bilateral acetabular fracture requiring an anterior approach, and especially patients with fractures of the acetabulum combined with pelvic ring injury - a combination named “devastating dyad” [11] - are those who can benefit most from AIPA. Bilateral exposure from the midline combined with a lateral window from the IIA, the so-called Hirvensalo ilioanterior approach [30], enable work on the entire inner part of the pelvis, including the true pelvis. As a result we can avoid bilateral IIA, which is a very aggressive approach [32].

The only part of the innominate bone that cannot be reached through AIPA is the anterior wall region of the acetabulum, including the pubic root and also the dome. These fractures should be approached either through classic IIA or by AIPA combined with the lateral window of IIA through an extension of the lateral window distally in the form of a Smith-Petersen approach. In their study, Sagi et al. reported four patients (out of fifty-seven included in the study) for whom conversion to IIA in order to access the dome,

pubic root or anterior wall was required, but that this was at the start of this surgical procedure [26]. On the contrary, Hirvensalo et al., [30] maintain that there were no exclusion criteria for using AIPA in a large series of patients. Although the intention of AIPA has not been to replace IIA but to be an easy alternative for a specific pattern of fractures [31], surgeons who have started to practice AIPA confirm that they do not use any IIA in the treatment of acetabular fractures.

Biomechanics

Medial wall fractures of the acetabulum, involving the quadrilateral plate with central dislocation of the femoral head, are very challenging in terms of fixation. As they are very often a result of low-energy trauma in elderly patients with a minimal bone stock, and because of their close relationship to the hip joint, with limited access, reposition and fixation are surgically challenging. The problem is exacerbated when we consider the fact that the fracture is located in the true pelvis, which cannot be visualized but is only palpable through IIA.

Different fixation techniques have been described to reduce and fix this quadrilateral plate and to medially buttress the medial wall against the fracture mechanism using IIA. In his monograph [15], Letournel noted the difficulties encountered with these kinds of fracture patterns. He proposed inserting long screws through the reconstructive iliopectineal plate, parallel to the quadrilateral lamina. This procedure is very challenging for surgeons and has a high probability of complications related to hip joint penetration. Tile [10] describes tangential screws that penetrate and hold the lamina medially. Several studies have reported successful retention of the medial wall with cerclage wiring [33-36]. Other authors have also reported a successful retention of the medial wall with a medial buttressing plate (1/3 semi-tubular, H-plate [12], reconstruction plate [10], T-plate [37]) with the short limb placed under the reconstructive iliopectineal plate and the long one buttressing the quadrilateral lamina. Culemann et al., [12] have compared different fixation techniques with conventional reconstructive plates, with or without medial buttressing plates, and locking implants in a biomechanical study, and concluded that both techniques ensure a sufficient stabilization of the medial wall to prevent a protrusion of the quadrilateral plate.

In contrast to classic IIA, the need to put the plate against the fracture forces pushed Hirvensalo [24, 30] and Cole [27] to come up with AIPA, allowing for a more rigid and biomechanically more reasonable infrapectineal plating since it is placed in the same plane as the fracture compared to other techniques that are tangential or perpendicular to acting forces [38]. Laflamme et al., [39], because of the possibilities of failure of these patterns of fracture accessed through IIA, consider infrapectineal plating to be an

alternative to total hip arthroplasty, and the elderly presenting ACPHT fractures can expect good functional results with a low complication rate.

The risk of intraoperative complications – injury of neurovascular structures

AIPA and IIA deal mainly with the same anatomical neurovascular structures, but look at them from opposite sides. The main theoretical advantage of AIPA, because it avoids the preparation of the main vascular structures, would be a decrease in the incidence of intraoperative injury of the major blood vessels, which has catastrophic consequences for the patient and is the most disturbing situation that can occur in the operating theatre. Our comparative analysis presented in Table 13 does not support this hypothesis, even though Letournel's series [15] presents a slightly higher percentage of injuries to the internal iliac vein compared to others.

Retropubic anastomosis of the external iliac vessels and the obturator vessels (or corona mortis) is a term used descriptively in the past - and particularly in Letournel's IIA - as the most dangerous point of the operation and which can lead to massive bleeding [6, 15]. On the other hand, anastomosis during AIPA is routinely identified and ligated, and this is a standard step in the procedure. Even though we tend to think that this anastomosis is not often present, as presented in our textbooks [15], recent anatomical studies confirm that anastomosis is present in a high percentage of cases (between 66.7% and 90%), with more than half having a diameter greater than 3 mm [40]. The obturator vessels including anastomosis with the external iliac vessels are the subject of variations [40]. If this anastomosis of the external iliac vessels and obturator vessels is present, and is of a large calibre, and we take into account the fact mentioned above that is the subject of variations, it can cause serious problems during IIA. In practice this is unusual, and literature refers mainly to bleeding that has been successfully controlled.

Since the iliolumbar vessels are so close to the iliopectineal line they are also a subject of interest during AIPA [40]. No injury is referred to in the literature. It is quite interesting to note that superior gluteal artery injury during AIPA has not been mentioned in other anatomical and clinical studies of interest, even though Sagi et al., [26] have reported intraoperative bleeding from the superior gluteal artery that required packing and embolization.

If the femoral nerve and lateral cutaneous nerve of the thigh were subject to injury during IIA, different grades of obturator nerve injury have been raised as a point of interest since AIPA has begun to be implemented in clinical practice. The nerve crosses the iliopectineal line most often 2cm from the sacroiliac joint, but with variation [40]. Sagi et al., [26] report a significant adductor weakness in a quarter of

patients, all but one of whom recovered between six months to one year after injury/surgery. Hirvensalo et al., [30] do not refer to any injury of the obturator nerve, but Cole et al., [27] refer to two cases.

Table 3: Intraoperative and immediate postoperative complications.

IIA						
	No.pt.	Vascular injury	Lateral femoral cutaneous nerve	Femoral nerve palsy	Sciatic palsies	Obturator nerve
Letournel E. Judet R. [15] within 3 weeks	158 IIA	1 injury to the external iliac vein 3 injuries to the internal iliac vein (2.53%)	40 (22.5%)	2 transient palsies of the femoral nerve 1 permanent loss of iliopsoas function	5 (2.7%)	0
Matta J. [41]	116	1 laceration of the femoral artery (0.86%)	NR	1	1 peroneal palsy	0
AIPA						
Hirvensalo et al. [30]	164	1 lesion of the external iliac vein after AIPA in pelvic fracture surgery (0.61%)	20, leaving permanent discomfort in one female pt			NR
Andersen R. et al. [22]	17	0	2	0	0	0
Cole et al. [27]	55	0	0	0	0	2
Wolf H. et al. [31]	23	NR	NR	NR	NR	NR
Sagi et al. [26]	57	Superior gluteal artery injury				¼ of all pt palsies, all recovered but one
Ponsen et al. [32]	25	1 injury of the common femoral artery (4%)	NR	1	NR	NR

Tissue sparing and postoperative complications

Authors confirm that there is no longer need for the middle window of IIA [22] when the "Stoppa" window is opened. Avoiding the middle window has the advantage of not requiring the opening of the inguinal canal, thus theoretically leading to less abdominal wall complication, less operative time, and a lower infection rate. One other very important advantage is that the femoral blood vessels including the lymphatic and nerve are left within their fasciae as they are avoided, and theoretically we would expect a decreased rate of DVT and other forms of thromboembolic complications and also a decreased rate of lymphoedema. We therefore analysed the rate of these complications in the selected literature to see whether or not it supports these hypothetical advantages of AIPA versus IIA.

Thromboembolic complications

If we look at the literature the results of large series are comparable in both approaches and they do not allow us to conclude in favour of one or the

other. Letournel [15] refers to fourteen DVTs (2.46%) and eight PEs (1.40%) in 569 operated patients with acetabular fractures, 158 of whom were with IIA within three weeks of injury. We were unable to find in his work the percentage of thromboembolic complication that is related only to IIA, and also because of the changes in thromboprophylaxis during the years between when the study was carried out and the cases were collected, the results are therefore not comparable with other series. Matta J. [14] refers to no DVTs and three PEs (2.58%) in 119 IIAs. Hirvensalo E et al., [24] refer to five DVTs confirmed with ultrasound or venography (3.04%) and one PE (0.60%) in 164 patients treated with AIPA. Ponsen et al. refer to a relatively high number of thromboembolic complications; however they are also related to patients with pelvic fractures included in this study. One of the DVTs developed into a PE. Other authors listed in the table below do not refer to thromboembolic complications after AIPA.

Letournel [15] refers to lymphangitis, and noticing oedematous swelling on the upper thigh with redness and warmth when he started to use IIA. After beginning to dissect further from the femoral vessels, the phenomena no longer appeared. There are no cases of lymphoedema after AIPA in the reviewed literature.

Table 4: Thromboembolic anterior abdominal wall complications and heterotopic ossification in AIPA and IIA.

IIA						
	No.pt.	DVT	PE		Groin hernias	Heterotopic ossification
Letournel E. Judet R. [15] within 3 weeks	569 (158 IIA)	14/569	8/569 (1.40%) 2/158	3.86%	2 (0.35%) 8 (1.4%) asymmetry of the anterior abdominal wall	7 (4.2%) 1 significant (0.6%)
Matta J. [41]	116	NR	3(2.58%)	2.58%	0	Significant 1/116
AIPA						
Hirvensalo et al. [30]	164	5 (3.04%)	1 (0.06%)	3.1%	0	5 (4 of them without sy) NR
Andersen R. et al. [22]	17	0	0	0	0	NR
Cole et al. [27]	55	0	0	0	1	0
Wolf H. et al. [31]	23	0	0	0	0	NR
Sagi et al. [26]	57	0	0	0	2 direct (3.5%) 1 atrophy of the rectus (1.75%) 0	NR
Ponsen et al. [32]	25	3 (12%)	1 (4%)	12%	0	NR

Inguinal canal

When considering the lower invasiveness of this approach we can also point out that the inguinal canal is spared from dissection. This will require less operative time for preparation and closure, however most importantly we would expect a significant decrease in the rate of groin hernias. The literature does not support this hypothesis.

Letournel [15] refers to two hernias requiring an operative intervention and eight asymmetries of the anterior abdominal wall on coughing. Matta et al., [14] refer to no groin hernias as a complication of IIA. Sagi

et al., [26] report two direct groin hernias and one atrophy of the rectus abdominis muscle on 57 operated patients using AIPA, Cole et al., [27] report one inguinal hernia on 55 operated patients using AIPA.

Operative time

Time is an important factor in the surgery but not the most important one. Longer operative time is linked to more complications related to increased tissue trauma and exposure of the wound leading to increased levels of infection, greater blood loss, and an increased rate of other local and general complications. Longer operative time with more blood loss makes the surgeon's "second hit" stronger, thus increasing the possibility of adverse outcomes especially in elderly, polytraumatised or exhausted patients.

The operative time is related to the type of operative approach. It also depends on the surgeon's experience and surgical team and other technical facilities. If we exclude other factors, especially if we consider the preparation of the inguinal canal and also closure of the wound, AIPA should theoretically have been carried out faster than IIA.

There is insufficient information about the operative time in the literature, since different institutions measure the beginning and the end of the operative time differently, and also some papers do not refer to the operative time. As a result, according to the literature that we have selected as a basis for this review and which is presented in Table 5, we cannot vote in favour of either approach.

Infection

Our analysis of the literature presented in Table 5 does not show any significant difference in the rate of infection between the two approaches. Higher levels of wound infection in Letournel's [15] series have been explained due to an absence of the use of prophylactic antibiotics before 1990. After that, the incidence of infection decreased to 1.4%, which is comparable to the incidence after AIPA in the literature presented. It has been noticed that the main source of infection is the haematoma that forms in the lateral window of IIA, and we are aware that very frequently (in 40-60% of cases) AIPA follows the opening of this lateral window.

Although it would seem that there is little difference between the presented radiographic and clinical results of the two approaches, our conclusion is that it is impossible to precisely compare and interpret the results in the presented series. Some lack important information but most importantly different papers used different criteria/scales to present the results of their studies. In addition, the results are influenced by other factors that are not controlled in the different studies, including details of

operations that are not standardized, postoperative protocol and other elements.

Table 5: Operative time, blood loss and infection rate.

IIA					
	No.pt.	Operative time	Blood loss	Superficial wound infection	Deep wound infection
Letournel E. Judet R. [15] within 3 weeks	569 (158 IIA)	NR	62 cases well recorded: 1 case: less than 0.5l 13 cases: 0.5-1l 11 cases: 1-2l 17 cases: 2-3l 20 cases: more than 3l	6 (3.79%)	3(1.89%)+1(0.63%)late
Matta J. [41]	116	3.7h	1500cc	3	0
AIPA					
Hirvensalo et al. [30]	164	* Pelvis B-type 112min Pelvis C-type 1h 43 min (IIA, without post app.) * IIA for acetabular fr. NR	Pelvis B-type 760ml Pelvis C-type 1540ml (ant. +post. Approach) IIA for acetabular fr. NR	2	0
Andersen R. et al. [22]	17	4.7 hours	1063ml	1	1
Cole et al. [27]	55	?	?		1
Wolf H. et al. [31]	23	NR	NR		1
Sagi et al. [26]	57	263 min (4h 23min)	690ml	1	
Ponsen et al. [32]	25	195 (3h 15min)	2000	1	

This confirms the need for a prospective multicentric controlled study in order to obtain comparable results and also the complication rate between IIA and AIPA.

Table 6: Radiographic and clinical results.

IIA																		
	No. pt.	Reduction criteria							Clinical results									
		Anatomic 0-1mm		Satisfactory 2-3mm		Unsatisfactory >3mm			Excellent		Good		Fair		Poor			
Letou rnel E. Judet R. ¹⁵ within 3 week s	158 IIA	418 73.72%		149 26.27%					62.4%		Very good 11 %		Good 7.3%		Intermediate 6.1 %		13.2%	
Matta J. ⁴¹	116	88	74 %	16	16 %	12	10 %	30	37 %	38	47 %	11	14 %	2	2 %			
AIPA																		
Hirve nsalo et al. ³⁰	164	0-2 mm		3-5mm		>5mm				HHS ¹ >80		HHS 60-79		HHS <60				
		13	84 %	15	9 %	14	8 %			10	75 %	22	16 %	13	9 %			
Anders on R. et al. ²²	17	14	82 %	3	18 %	0	0 %											
Cole et al. ²⁷	55	Excellent		Good		Fair+poor				47 %		42 %		9 %		2 %		
			64 %		25 %		11 %											
Sagi et al. ²⁶	57	35				4	8 %	23	46 %	21	42 %	1	2 %	5	10 %			
Ponsen et al. ³²	25	11	58 %	7	37 %	1	5 %											

¹ Harris Hip Score

Conclusion

One must understand that there is no ideal and easy approach for the treatment of acetabular fractures. It is always laborious and risky surgery.

IIA is used widely in the Republic of Macedonia as an anterior approach to the acetabulum. Unfortunately we still have not implemented AIPA in our country.

According to some authors, AIPA has certain advantages compared to IIA. A wide surgical field and easier access to the medial wall of the innominate bone, much easier and biomechanically reasonable infrapectineal plating (especially when dealing with the osteopenic bone), easier postoperative rehabilitation, less invasive dissection avoiding the opening of the inguinal canal without compromising the inguinal floor, no dissection around the femoral blood and lymphatic vessels, direct visualization of the entire pelvic brim, direct visualization and easier access for the ligation of the corona mortis, direct visualization of the posterior column: all make this approach superior to IIA.

Which approach is better? We must always respect the rule that the best approach is that the surgeon best knows. Implementing a new approach always needs a lot of knowledge, training and labour.

Will AIPA replace IIA in our country as well? A controlled prospective study is lacking, which should be multicentric because of the low incidence of acetabular fractures in order to compare the final results, complication rates and other parameters that will enable us to reach a conclusion about the superiority of one approach or the other. However, based on the facts presented in this review regarding anatomical and biomechanical advantages, the approach should be implemented in our everyday practice and we are comfortable in stating this preference, especially due to the fact that there is no significant difference when comparing the complication rates of the two approaches. Based on the low incidence of complication we can consider this approach to be relatively sure, but we must acknowledge the fact that the approach is technically demanding and can be considered as safe only in the hands of experienced general or orthopaedic surgeons specialised in acetabular and pelvic surgery.

Acknowledgements

Ss Cyril and Methodius University of Skopje PhD School covered publication fee for this review article.

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