

# Functional and Orthopedic Treatment of Acetabulum Fracture: Hospital Evolution of a Series of 26 Cases

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**Abstract:** Acetabulum fractures have been treated by functional and orthopedic method in 26 patients. The study focuses on hospital phase. Quality of care at this time influences functional prognosis of hip. Functional treatment has involved 14 cases and 12 cases orthopedic treatment. Traction has been used 14 times or 53,8 %. The global joint congruence roof-head and head-acetabulum according to the criteria of Duquenois were perfect and good respectively 84,6 %, 80,8 %.

**Keywords:** Acetabulum fracture- Bone traction- Functional treatment- Orthopedic treatment.

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## 1. INTRODUCTION

The work of Judet and Letournel have allowed better management of acetabulum fractures [1]. Orthopedic treatment of displaced fractures are common in developing countries [2]. The number of cases performed annually in France is in down [3]. There are good results with none operative treatment [4,5,6]. Traction is systematic in the treatment of displaced fracture but is little used in non-displaced fractures. A recent series of 26 cases were followed particularly in hospital phase. This is a time where bone traction must be regularly adapted. Its monitoring is not always strict. The influence on the articular congruence is variable. The aim of this work is to highlight the basics of none operative treatment while drawing attention to the role of traction in treatment success.

## 2. PATIENTS AND METHOD

This is a retrospective study (January 2009 to February 2012) and prospective (March 2013 September 2013) performed in the orthopedic department of Charles Nicolle hospital. It involved patients treated in the service for a fracture of the acetabulum. Inclusion criteria were : age over 15 years, the acetabulum fracture treated functionally or orthopedic and radiological monitoring particularly in hospital phase for at least 21 days in case of disturbance of articular congruence requiring traction. Time has not been limited for monitoring during hospitalization in functional treatment. Exclusion criteria were : unstable dislocation hip fracture and fracture treated surgically. The study parameters sociodemographic, clinical, radiological and therapeutic analysis of congruence with head-roof and head-acetabulum according to the criteria of Duquenois [7].

## 3. RESULTS

### A. Demographics:

26 cases have been collected. These 22 male patients and 4 females with a sex ratio of 5,5/1. The average age was 44,3 years with extremes of 17 years and 70 years. The right side was affected in 38 % and the left side in 62 %. Accident public roads represent 80,9 %, falling from a height by 19 % occupational accidents and domestic accidents 0,1 %.

### B. Clinical:

The Injury Severity Score (ISS) was less than 12 (n=8), between 12 and 14 (n=10), between 16 and 24 (n=2) and over 24 (n=6). The highest scores were 41 and 43. These two patients died. Traction was tolerated.

**C. Radiology:**

Radiographs of the pelvis, ¾ shutter, ¾ wing, and pelvis scanner were made in 25 patients. Scanner was not done in a patient. Injuries were described according to the classification of Judet-Letournel. Their distribution according to the age has been made in Table I. The acetabular protrusion was observed in the transverse fracture (n=3). The impaction of roof and the acetabulum existed in a fracture T and in a fracture of two columns. These two fractures were comminuted. Each week on average, a radiograph of the pelvis was made. No radiograph was made at day 0

**TABLE I: DISTRIBUTION OF INJURIES ACCORDING TO AGE**

	Less than 40 years	40 years to 50 years	50 years to 60 years	Over 60 years	Percentage %
Fracture of the anterior wall	-	-	3	1	15,4
Fracture of the anterior column	1	-	-	-	3,8
Fracture of the posterior column	1	-	1	-	7,7
Fracture of two columns	-	4	-	-	15,4
Transverse fracture	4	-	2	-	23,1
Fracture T	2	1	1	1	19,2
Fracture of anterior column + posterior transverse hemi	1	-	1	-	7,7
Transverse fracture + anterior wall	1	-	1	-	7,7

**D. Functional treatment:**

It was indicated in 14 patients. Table II gives distribution of injuries according to the treatment. The congruence header and roof header acetabulum was fair and bad in two patients (14,3 %), before and during treatment. This congruence was perfect and good in other (12 patients or 85,7 %). Average hospital stay was 3,7 days with extremes 1 day and 9 days. One death was observed. Monitoring the hemodynamic status requires hospitalization of a patient and bone lesions were for other cases. Two bone tractions were made in patients who had a transverse fracture of the acetabulum.

**TABLE II: DISTRIBUTION OF INJURIES ACCORDING TO THE TYPE OF TREATMENT**

Injury	Functional treatment	Orthopedic treatment
Fracture of the anterior wall	4	0
Fracture of the anterior column	1	0
Fracture of the posterior column	1	1
Fracture of two columns	1	3
Transverse fracture	4	2
Fracture T	2	3
Fracture of anterior column + posterior transverse hemi	0	2
Transverse fracture + anterior wall	1	0
Transverse fracture + posterior wall	0	1
Total	14	12

**E. Orthopedic treatment:**

It was conducted in 12 patients. Table II gives distribution of injuries according to the treatment. Congruencies head-roof and head-acetabulum were perfect and good respectively in 66, 6 % (n=8) and 41,6 % (n=5). These congruencies were fair and bad in 33,3 % (n=4) for the head and the roof and 58,2 % (n=7) for the head and acetabulum. After traction, the roof-header was perfect congruence (n=6 or 50 %), good (n=4 or 33,3 %), fair (n=2 or 16,6 %) and bad (n=0). Congruence head-acetabulum was perfect (n=4 or 33,3 %), good (n=5 or 41,6 %), fair (n=3 or 25 %) and bad (n=0). The traction was made to consolidate a fractured pending total hip arthroplasty (n=1), an analgesic purpose (n=2) and reduce fracture (n=9). Trans condylar traction was performed 7 times and the trans-tibial traction 5 times. Period of traction was 24 hours (n=9), upper 24 hours (n=3). When the weight of traction was specified, it was at day 0 an average of 6 kg with extremes of 5 kg and 9 kg. Change the traction weight (increase) was noted on day 2 (n=2). The weight of traction end of hospitalization average 6 kg with extremes of 6 kg and 8 kg. Torsion of the traction pin was observed once. Three infections of the pin was processed locally by fusidic acid. A sciatic nerve injury was observed at day 3 of traction in a patient who had blending disorders. A functional bowel obstruction was observed. There were no bedsores. The length of

traction average 33,5 days with a range of 12 days and 50 days. No secondary plaster cast was made. One death was observed.

**F. Global results:**

Before treatment vertical congruence was perfect (n=10), good (n=10), fair (n=4), bad (n=2). Horizontal congruence was perfect (n=11), good (n=6), fair (n=6), bad (n=3). The head-roof congruence that was fair and bad before treatment in 23,1 %, was changed in 15,4 %. Those between the head and the acetabulum was fair and bad in 34,6 %, was changed to 19,3 %. Global results of articular congruencies after treatment are given in Table III and in Table IV.

**TABLE III : DISTRIBUTION OF VERTICAL CONGRUENCE ACCORDING TO DUQUENNOY CRITERIA**

Congruence Head-Roof	Cases number	Percentage (%)
Perfect	11	42,3
Good	11	42,3
Fair	3	11,6
Bad	1	3,8

**TABLE IV: DISTRIBUTION OF HORIZONTAL CONGRUENCE ACCORDING TO DUQUENNOY CRITERIA**

Congruence Head-Acetabulum	Cases number	Percentage (%)
Perfect	13	50
Good	8	30,8
Fair	4	15,4
Bad	1	3,8

**4. DISCUSSION**

There is no rationalization in the treatment of acetabulum fractures [3]. Stability of the hip, integrity of area bearing and articular congruence are conditions of none operative treatment [8]. The problem of treatment arises in displaced fractures where some factors are essential ,the degree of displacement (less than 3 mm), its relationship with the bearing area of the acetabulum (a stair walking 2 to 3 mm is not tolerated), age, general condition, bone density, pre existing osteoarthritis [1,3,9,10,11]. Literature is poor on the care in hospital period including that of traction. Our demographic and pathological findings are consistent with those in the literature [1,2,3,6]. The head-roof congruence that was fair and bad before treatment in 23,1 %, was change in 15,4 %. That between the head and the acetabulum was fair and bad in 34,6 %, was change to 19,3 %. In two patients the consolidation in a better position was wished in the expectation of a total hip prosthesis. Congruence between the head and the acetabulum was more difficult to obtain for fractures of the anterior column, transverse and T. The impaction existed in both cases. The communiton was the cause twice and acetabulum protrusion 3 times. These are factors of incongruence [3]. The lesions of the posterior acetabulum and the roof require anatomical reduction difficult to get orthopedically [10,12]. However studies have shown its effectiveness in certain unstable estimated lesions [5,6]. The extend of the arc subchondral directs the therapeutic approach in these case [9]. Functional treatment performed in 53,8 % of our cases involved lesions of the anterior acetabular without alteration of the articular congruence in patients older than 50 years (46 %). The anterior acetabulum is a non-bearing zone of the hip with good results in none operative treatment [12,13]. Traction is not systematic in the functional treatment. It helps relieve hip and fight against pain and inflammatory phenomena. It reduces the period of early indication of the total hip replacement for osteoarthritis [14]. The traction plays an important role in the gradual reduction of displaced fractures but it does not correct some displacements such as rotation and some fragmentary impaction of the roof and the posterior column. It may require devices such as abduction cushions. There are two types of traction: osseous and elastic. Bone traction may be at tibia or at condyle. The elastic traction can be made in short period. There are tensile sets containing adhesive strips. There are provided with ropes and pulling a spreader bar with foam protection for ankles. After shaving the skin, dab with a local antiseptic solution and apply beginner tape on the inside of the leg. Its complications are skin and strength of traction is reduced gradually. Bone traction obeys rules. Literature is poor [15]. This is a surgical procedure that is not often performed in the rules of art. Our pins infection may be due to an aseptic neglect. It is common in the literature. Choice between a condyle and a tibial traction depends on several factors including the degree of displacement. Local anesthesia is carried out with 2 to 3 ml of 1 % lidocaine dermal infiltration to periosteum by ensuring

the absence of prior adverse reactions. If tibial traction which is the most common [15], infiltration will occur at a through finger distally of the relief of the tibial tubercle and through a finger on either side of the ridge tibial. It is essential to remember the location of the peroneal nerve and stick to distance. Our nerve damage is late (day 3) which reflects a non iatrogenic etiology. Exploration has not be done because the patient later died. We choose a large caliber metal pin (Steinman pin 4 mm diameter). The pin twist in one of our cases is linked to small size. An incision with scalpel is preferable to the external face of the anterior tibial tuberosity. An assistant performs a manual traction and reduces leg external rotation. Pin must be oriented perpendicular to the skin. It can be introduced with a hand drill or a motor. Skin of the medial side can be incised or be crossed by the pin. The ends of the pin are cut and turned to the stirrup. Skin ports are protected with an antiseptic swab that should not stay more than a day or two. Avoid dropping and even put the stirrup on the tibial crest. If traction trans condylar, the pin is down to 5 cm behind the front plane of the patella at the lateral condyl tubers. The member is placed on a splint Boppe with abduction of 40°, hip flexion 30° and knee flexion 30°. Seen in profile traction is directed along the bisector of angle between tibia and the extension of femur. Front view, it extends the femur. The pulling force must be adapted to muscle tone that is not necessary based on body weight. It is generally greater than 3 kg and can reach the 1/5, 1/8 or 1/10 of the body weight. The pulleys and weight must be free. A caudo-cranial tilt of the patient in the bed can be helpful. Traction is strong for 20 to 30 days. Condyle traction will be changed from the 30<sup>th</sup> day in a trans tibial traction. Duration of the traction is 30 to 60 days variable. Short term is source of osteoarthritis. Prolonged bed rest is source of complications and makes the inappropriate traction in the elderly [16]. Traction is ineffective when the weight resting on the floor, the slack rope or wedged in a pulley and if the patient's feet rest the end of the bed. The beginning of early consolidation often limits the progressive reduction by traction. After 5 days the complex fractures are difficult to reduce and after 15 days, simple fractures are motivating an early assessment of the effectiveness of orthopedic treatment [3]. The first two weeks are very important for successful treatment for displaced fracture. Traction limits the possibility of control by the scanner and the radiographic ¾. The lack of evaluation of the subchondral arc in displaced fractures treatment is one of weakness of our work [9]. Scanner is not available to all patients particularly in some developing countries [2]. Radiograph of the pelvis allows to value the "roof arc" but this X-ray done at the bedside in traction is often of poor quality. 6 marks in the acétabulum on the frontal radiograph and joint reports orient the quality of treatment. Radiographic monitoring takes over the monitoring of traction and yet it is what determines its results. We have not be able to see all patients after work. The main objective of study concerned the treatment in hospital period that determines the subsequent evolution. There are few studies on the long-term monitoring of none operative treatment [5,10,14]. Nonunion is rare [17]. Articular malunion was predictable source of osteoarthritis in two cases where the total of secondary hip replacement was indicated. The impaction of the roof of the posterior column and failure congruence in one of the three planes of space are the main criteria of the move towards early osteoarthritis [3]. Functional recovery margin despite osteoarthritis is to maximize before total hip replacement in young people and adults.

## 5. CONCLUSION

None operative treatment was to realize more often functional treatment for lesions in non-bearing zone. The recommendations are consistent with those in the literature with a generally good and perfect joint congruency at discharge. Condyle and tibia traction were performed in the same proportion to unload the hip in 14,3 %, for a progressive reduction of the fracture in 71,4 % and in the expectation of a consolidation without seeking anatomical reduction in 14,3%. The limits of traction are variables whose radiographic monitoring. The benefits of traction are to operate within the first two week. The collaboration of the nursing staff and the entourage of the patient are essential.

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