Traumatic hip dislocations-therapeutical problems

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Abstract

INTRODUCTION: Traumatic hip dislocations are nowadays one of the most interesting subjects for orthopedic debates, due to their increasing frequency especially in young, active patients and their difficult and late recovery

Proper treatment of traumatic hip dislocations means, first of all, early reposition of the femoral head into the acetabulum. This requires early diagnosis of the dislocation, complete evaluation and treatment of the injuries, which are often, more complex than expected.

Excepting the intra-pelvic hip dislocation, the other types of traumatic hip dislocations are produced by traumatic forces with the following characteristics: the application point on the anterior surface of the knee, the direction form caudal to cranial, the intensity determines the type of the injury – if it is high enough, it can affect the hip joint (isolated or associated with a patellar or distal femoral fracture).

Early clinical diagnosis of traumatic hip dislocations is based, first of all on the vicious position of the leg, which is different for each type of dislocation. Whenever traumatic hip dislocations is suspected, radiological and CT evaluation of the injured hip are to be recommended. Once confirmed, the dislocation must be reduced as soon as possible Literature shows that osteonecrosis of the femoral head, osteoarthritis of the hip, heterotopic ossifications are common late complications after traumatic hip dislocations, especially when the reduction is performed late after trauma (after more than 6 hours).

MATERIAL AND METHOD: This refrespective study includes 22 cases of traumatic hip dislocations, treated in our hospital between 1.01.1996- 1.01. 2001, with traumatic hip dislocations which was reduced after more than 12 hours after trauma due to delayed arrival in our hospital.

When the time from initial trauma was less than 48 hours, emergency closed reduction was attempted (16 cases). In two cases, closed reduction was impossible, so emergency surgical reduction was performed. In 14 cases, we achieved a successful closed reduction under anesthesia, but in 1 case, emergency surgery was indicated because the dislocation was recurrent, and the joint was unstable; in the rest of the 13 cases, after closed reduction, computer tomography was performed in order to evaluate the joint congruence.

In five cases, after CT scan examination, orthopedic treatment was performed.In 8 of the 13 cases, even if closed reduction was possible, surgery was indicated after CT scan examination.

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Abbreviations:

THD - Traumatic hip dislocations

ANFH – Avascular Necrosis of Femural Head

HO - Heterotopic Ossifications, CR - Closed Reduction

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87,50 % of these patients developed late complications.
Three patients had the dislocations reduced after more than
48 hours after trauma, less than one week, and all of them developed late complications – two had avascular necrosis of the femoral

RESULTS: After a follow-up of 3- 8 yrs, the patients were evaluated from the point of view of Avascular Necrosis of Femoral

Therefore, from the eight patients who had 12-24 hours from

trauma until hip dislocation, two developed avascular necrosis of

Head, osteoarthritis of the hip and Heterotopic Ossifications.

head, and one had osteoarthritis, when reviewed. CONCLUSIONS: Functional recovery after traumatic hip dislocations is long, difficult, and most frequent, incomplete, as their late complications determine considerable disabilities of the hip joint, including osteoarthritis (which becomes difficult to treat when patients are young). Their prognosis depends not only on the energy of the traumatic agent, but also on the time between trauma and femoral head reposition. The longer this time is, the greater the risk of late complications (avascular necrosis of the femoral head and osteoarthritis) is. (Revista de Medicină de Urgență, Vol. 2, Nr. 1, 6-18).

Keywords Atraumatic hip dislocations, early reduction, late complications.

Introduction

Traumatic hip dislocations (THD) are nowadays one of the most interesting subjects for orthopedic debates, due to their increasing frequency especially in young, active patients and their difficult and late recovery, which determines a late social and professional reinsertion of the patients.

Proper treatment of THD means, first of all, early reposition of the femoral head into the acetabulum. This requires early diagnosis of the dislocation, complete evaluation and treatment of the injuries, which are often, more complex than expected.

Each type of dislocation is characterized by a specific mechanism, a particular vicious position of the injured leg and particular maneuvers which are to be done when closed reduction is attempted.

The incidence of late complications following traumatic dislocations of the hip is correlated with the time between trauma and joint restoration.

Modern traumatology is characterized by high-energy trauma agents that determined increased frequency of some of the injuries of the skeleton followed by significant impairment of locomotion system. One of these injuries is represented by traumatic hip dislocation (THD), which has very important late consequences, even if correctly treated, due to the anatomical and biomechanical characteristics of the hip joint. All the late complications of traumatic hip dislocations affect in a dramatic way every activity which means sitting, standing, walking, not to mention running, or other sport activities.

Hip dislocations are classified into:

- regular hip dislocations, which, depending on the displacement of the femoral head from the acetabulum, are: postero-superior, postero-inferior, antero-superior, antero-inferior, and
- -unregular hip dislocations. [1]

The type of the dislocation depends on the characteristics of the traumatic force – the application point, the direction and the intensity. [2] Excepting the intra-pelvic hip dislocation (which is produced by a traumatic force acting on the external surface of the hip, with considerable intensity, which disrupts the acetabulum and allows the femoral head to migrate into the pelvis), the other types of THD are produced by traumatic forces with the following characteristics:

- the application point on the anterior surface of the knee, with the knee joint with different degrees of flexion;
- the direction form caudal to cranial, so the energy is transmitted to the patella, to the distal femur, and than, to the hip joint;
- the intensity determines the type of the injury: if it is low, it produces a fracture of the patella, if the energy increases, a distal femoral fracture can appear (isolated or associated with a patellar one), or, if it is high enough, it can affect the hip joint (again, isolated or associated with a patellar or distal femoral fracture).

Usually, this situation appears following road traffic accidents, when a frontal crush of the vehicle affects the people from the front seats – the driver and the one sitting next to him, that is why it is included in the "the front seat syndrome", and both the orthopedic surgeons and emergency medicine physicians must be aware to look for a hip dislocation when they examine a patient who suffered such an injury. Other situations frequently followed by THD are accidental falls, but in all these cases, the previous characteristics of the traumatic force are to be found. That is why it is very important to underline that the position of the injured leg is specific for each type of dislocation, [3] and it is closely connected with the position of the leg in the moment when the traumatic force acted:

- postero-superior dislocations appear when the hip is flexed no more than 90 degrees, slightly adducted and internally rotated, so the position which must suggest a postero-superior hip dislocation is a moderate (or minor) flexion of the hip, with the thigh adducted and internally rotated;
- postero-inferior dislocations appear when the hip is flexed more than 90 degrees, adducted and rotated internally, so the position of the leg is higher flexion, adduction and internal rotation;

- antero-superior dislocations are characterized by minimal flexion, or even extension of the hip, minimal abduction and external rotation, with the injured leg shorter than the other; clinical examination shows the ascension of the patella compared with the other leg, which means that the leg is shorter due to an injury of the hip or thigh, and not of the shank;
- antero-inferior dislocations are characterized by increased flexion, abduction and external rotation of the thigh, and when the dislocation is bilateral, the position of the legs is called "the frog position."

The most important thing when examining a patient who has a vicious position of one injured leg, which looks like one of those previous described, is that the physician must gently try to recover the normal position of the leg, BUT if any elastic resistance is felt, the attempt must be abandoned and a hip dislocation must be suspected. In such a case, emergency orthopedic and radiological examination must be performed, as early reduction of the dislocation is essential for the future of the injured hip.

Literature shows that osteonecrosis of the femoral head, osteoarthritis of the hip, heterotopic ossifications are common late complications after THD even if reduced within the first 6 hours after trauma [4]. In order to underline the importance of early reduction of the hip dislocations, we performed a retrospective study in order to evaluate the consequences of delayed reduction of the dislocations upon hip anatomy and function.

Material and Methods

This retrospective surdy includes 22 cases of THD, treated in our hospital between 1.01.1996- 1.01. 2001. All these patients had the same characteristic: they had a dislocation of the hip which was reduced after more than 12 hours after trauma due to delayed arrival in our hospital. Mean age of the patients was 42 yrs (22- 56 yrs), 16 males, and 6 females. The time between trauma and the reduction of the dislocation was:

- -12 24 hrs 8 cases
- -24 48 hrs 8 cases
- -48 hrs -1 week -3 cases
- more than 1 week 3 cases
- The dislocations were:
- postero-superior 16 cases, from which 14 were associated with fracture of the posterior wall of the acetabulum
- postero-inferior 4 cases
- antero-superior 1 case
- antero-inferior 1 case and the time between trauma and reduction is described in the Table 1.

Tabel 1: Type of dislocations

	12-14 hrs	12-48 hrs	48 hrs-1 week	over 1 week
postero-superior	2	8	3	3
postero-inferior	4	0		
antero-superior	1			
antero-inferior	1			

When arriving in our hospital, orthopedic examination revealed signs of traumatic hip dislocation, so radiological examination was performed and the type of the dislocation was identified. Then, the attitude was different depending on the time from the trauma:

When the time from initial trauma was less than 48 hours, emergency closed reduction was attempted (16 cases). In two cases, closed reduction was impossible, so emergency surgical reduction was performed. In 14 cases, we achieved a successful closed reduction under anesthesia, but in 1 case, emergency surgery was indicated because the dislocation was recurrent, and the joint was unstable; in the rest of the 13 cases, after closed reduction, computer tomography was performed in order to evaluate the joint congruence.

In five cases, after CT scan examination, orthopedic treatment was performed.

In 8 of the 13 cases, even if closed reduction was possible, surgery was indicated after CT scan examination, because of:

 joint incongruity due to bone interposition of a small bony fragment from the femoral head (2 cases), and from the posterior wall of the acetabulum (2 cases),

- joint incongruity due to capsular interposition (1 case) with significant enlargement of the articular surface,
- joint instability due to large fragments of the posterior acetabular wall (three cases).

In all the six cases when the patients arrived in our hospital after more than 48 hours after trauma, no attempt of closed reduction was performed. CT scan examination was used in order to determine all the bone injuries, and then, surgical reduction of the dislocation was performed. In five of these cases, the dislocations were associated with fractures of the posterior wall of the acetabulum, so complete treatment included:

- evacuation of the haematoma and fibrous tissues from the acetabulum cavity
- reduction of the dislocation, by repositioning of the femoral head into the acetabular cavity
- reduction of the fracture of the acetabular wall and osteosynthesis of the fracture (with reconstruction plate and screws), which ensured the joint stability.

Table 2: Results after late reduction of hip dislocations

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			dosed reduction				Complications		6.1	
	type	time	(CR)	after CR	CI result	treatement	ANFH	ostecarthriti	s HO	folow-up
1 M, 24	post-sup	2 weeks	no attempt	CŤ		surgical		yes	yes	4 yrs
2 M, 28	post-inf	40 hrs	succefull	CT		ort <mark>hopae</mark> dic	yes			5 yrs
3 F, 32	post-sup	36 hrs	succefull	СТ	bone interposition	surgical	yes			6 yrs
4 M, 33	post-inf	16 hrs	succefull	CT		orthopaedic	;			6 yrs
5 M, 36	post-sup	32 hrs	succefull	СТ	bone interposition	surgical		ТХ	yes	3 yrs
6 M, 38	ant-sup	16 hrs	succefull	СТ		orthopaedic	JEN	ļA		4 yrs
7 F, 37	post-sup	28 hrs	succefull	СТ	bone interposition	surgical				3 yrs
8 F, 42	post-sup	3 weeks	no attempt	СТ		surgical		yes		7 yrs
9 M, 42	post-sup	26 hrs	imposible	emergency surgery		emergency surgery				6 yrs
10 M, 35	post-inf	15 hrs	succefull	СТ		orthopaedic	;			4 yrs
11 M, 46	post-sup	30 hrs	succefull	CT	capsular interposition	surgical	yes		yes	5 yrs
12 F, 41	post-sup	36 hrs	imposible	emergency surgery		emergency surgery				4 yrs
13 M, 34	ant-inf	18 hrs	succefull	СТ	joint instability	surgical				3 yrs
14 F, 48	post-sup	40 hrs	succefull	CT	bone interposition	surgical		yes		7 yrs
15 M, 51	post-sup	6 days	no attempt	СТ		surgical		yes		8 yrs
16 M, 44	post-sup	5 days	no attempt	СТ		surgical	yes			3 yrs
17 M, 28	post-sup	15 hrs	succefull	CT	joint instability	surgical			yes	4 yrs
18 M, 53	post-inf	20 hrs	succefull	CT		orthopaedic	yes			3 yrs
19 F, 52	post-sup	14 hrs	succefull	CT	joint instability	surgical				3 yrs
20 M, 56	post-sup	3 days	no attempt	СТ		surgery	yes			5 yrs
21 M, 33	post-sup	36 hrs	no attempt	emergency surgery		emergency surgery			yes	3 yrs
22 M, 22	post-sup	3 monts	no attempt - recurent	СТ		surgery		yes		6 yrs

Results

After a follow-up of 3-8 yrs, the patients were evaluated from the point of view of ANFH (Avascular Necrosis of Femoral Head), osteoarthritis of the hip and HO (Heterotopic Ossifications), and the results are included in Table 2.

As it can be seen, ANFH appeared in seven cases, osteoarthritis in five cases and heterotopic ossifications in four cases. It is more interesting, yet, to evaluate the evolution of the patients depending on the time between trauma and the reduction of the dislocation.

Therefore, from the eight patients who had 12-24 hours from trauma until hip dislocation, two developed avascular necrosis of the femoral head.

Eight patients had the dislocation reduced after 24 hours, but less than 48 hours after trauma–three of them developed avascular necrosis of the femoral head, one developed osteoarthritis and three had heterotopic ossifications, that means that 87,50% of these patients developed late complications.

Three patients had the dislocations reduced after more than 48 hours after trauma, less than one week, and all of them developed late complications- two had avascular necrosis of the femoral head, and one had osteoarthritis, when reviewed.

All the three patients with dislocations reduced (surgical) after more than one week following trauma developed osteoarthritis of the hip, and one of them also had heterotopic ossifications.

Discussions

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Traumatic hip dislocations are produced by traumatic forces which are strong enough to, even if acting indirectly on the knee, produce disruptions of the structures which maintain the integrity of the hip joint, so the normal anatomical reports between the acetabulum and the femoral head are lost.

The most frequent type of dislocation is the postero-superior one, when the femoral head is displaced out from the acetabular cavity, posterior and superior, due to a caudocranial traumatic force acting on the knee with the thigh in slight flexion, adduction and internal rotation.

The second, in order of the frequency, is the postero-inferior dislocation, produced by the same type of force acting on the knee with the thigh flexed more than 90 degrees, and considerably adducted and internally rotated ("one leg over the other").

Almost always, these dislocations are associated with a fracture of the posterior wall of the acetabulum or of the acetabular brow, and quite often a piece of the inferior part of the femoral head is fractured when the head goes over the acetabular brow, during luxation [5].

Less frequent than the posterior ones, the anterior dislocations are rarely associated with acetabular fractures. Clinical diagnosis of hip dislocations is not difficult for the regular types, and it is sustained by the pathological position of the thigh and the fact that this position is impossible to be corrected (trying the reverse movements), because of an elastic resistance in the hip joint. The complete diagnosis is established using radiological examination and computer tomographic scanning, which must evaluate the hip joint from two points of view – the congruence and the stability, as each of these characteristics is absolutely necessary for normal hip function, and the treatment must achieve these two goals. [6]

The congruence of the joint is achieved only if the surface of the acetabulum and that of the femoral head are parallel, that means that the distance between them is the same, allover the joint. During the maneuvers made for reduction of the dislocation, it is possible that bone fragments (isolated or with capsular attachments) or just capsular flaps are caught between the femoral head and the acetabulum so, the distance between the two surfaces is larger adjacent to the interposition, the two surfaces are not parallel any more and the joint is not congruent at all. In these cases, surgical treatment is indicated – bone or capsular interposition must be removed in order to restore joint congruence.

The stability of the hip joint is achieved by bony, capsular, ligamentous and muscular structures. The femoral head is "covered" by the acetabulum which acts like a collar; when the traumatic force acts from caudal to cranial, it produces abnormal movement of the femoral head, which tends to be extruded from the joint, but the acetabulum oppose to this movement, so, most often the femoral head produces a fracture of the acetabulum while dislocating. The influence of the fracture over the stability of the joint depends on the position of the fracture and the size of the fragment - the fractures associated with anterior dislocations are seldom affecting the hip stability, while those associated with posterior dislocations often produce major impairment of the joint stability, because they are situated in a region which takes the loading forces during weight bearing, so, when the patient starts walking, recurrent dislocations may occur .The size of the fragment is important, as joint stability is affected when the size of the fragment includes more than 1,5-2 cm of the articular surface, that is why surgery is indicated when CT scan examination detects one of the previous situations.

There are some things to discuss about the displacement of the fracture: since the fracture is produced by the moving femoral head, the fragment is first displaced by the femoral head; when this returns into the joint cavity (after reduction), there are three possibilities:

a. the fragment is a large one, with some capsular attachments, but after repositioning of the femoral head it is almost impossible that the acetabular fracture could reduce anatomically, because periosteum, muscular and capsular tissue interpose between the edges of the fragments, so surgery is indicated,

b. the fragment is a small one, almost "included" within the articular capsule, and after femoral head reposition, the

displacement of the fracture is not significant, so this is not an indication for surgical treatment,

c. the fragment is trapped within the joint, during reduction (situation previously discussed), so surgery is necessary.

There are also some situations in which capsulo-ligamentous structures are so severely damaged that recurrent dislocations may occur due to the fact that the place where the femoral head penetrates the capsule is so large that it doesn't heal, so it remains open, even if the dislocation was reduced. It is said that the easier the reduction is, the greater is the instability of the joint, and the risk of recurrent late dislocation is to be considered. In these situations, when the dislocation is reduced with minor maneuvers and the CT scan does not show any associated fractures, MRI examination is indicated, in order to evaluate the status of the soft tissues involved in joint stability. More than that, if the dislocation is reduced, but the reduction is unstable, it is obvious that the cause is severe disruption of the stabilizing structures (also clear indication for MRI examination and emergency surgery). [7, 8]

The reduction of the dislocation must be achieved as soon after trauma as it is possible, and the explanation is very simple. [9, 10] The vascular support of the femoral head and of a considerable part of the acetabulum is provided by the blood vessels of the articular capsule and of the round ligament (ligamentum teres), and these structures are both injured during dislocations, so, the longer the time the femoral head remains dislocated, the greater the ischaemia and the risk of avascular necrosis of the femoral head are. It must also be underlined that the femoral head is always affected (even if this is not macroscopically detectable), during dislocation, because of the mechanical conflict between it and the acetabular edge, which increases the risk of avascular necrosis. [11] Once avascular necrosis occurred, the surface of the femoral head becomes irregular, and affects the surface of the acetabulum, so the risk of osteoarthritis is considerable. More than that, if the dislocation is associated with a fracture of the acetabulum, usually this fracture is displaced, so the articular surface of the acetabulum is not regular any more, which increases the probability of late osteoarthritis.

Heterotopic ossifications are known to be very frequent after hip dislocations, but they are common after all types of hip surgery. Their prophylaxis (using, for example, Indometacin) is necessary, since they produce considerable impairment of the function of the hip.

If the reduction of the dislocation is delayed (because of various reasons), several things happen (besides those already discussed): the acetabular cavity fills with clots and fibrous tissue, which "occupies" the place where the femoral head should stay, so delayed reduction is embarrassed because the femoral head finds no place available. Then, muscular retraction and the shortening of the soft tissues make the late reduction even more difficult and, more than that, risky because considerable efforts to reduce an old dislocation may produce disruption of the soft tissues (not only capsule, ligaments, muscles, but even blood vessels and nerves). [12, 13]

Traumatic hip dislocations are frequent injuries, affecting especially young patients. Functional recovery after trauma is long, difficult, and most frequent, incomplete, as their late complications determine considerable disabilities of the hip joint, including osteoarthritis (which becomes difficult to treat when patients are young). Their prognosis depends not only on the energy of the traumatic agent, but also on the time between trauma and femoral head reposition. The longer this time is, the greater the risk of late complications (avascular necrosis of the femoral head and osteoarthritis) is.



Case1 – Postero-superior dislocation with displaced posterior acetabular fracture-reduction after 32 hours





Case1 - Affected articular surface



Case 2 – Postero-superior dislocation, 6 days after trauma



Case 2 – Postero-superior dislocation, 6 days after trauma-post-operative result

Case 2 - Osteoarthritis of the hip 6 years after trauma







Case 2 – Osteoarthritis of the hip 6 years after trauma



Case 2 – Osteoarthritis of the hip 6 years after trauma



Case 2 - Osteoarthritis of the hip 6 years after trauma





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Case 3 Late surgical reposition



Case 3 – Results 6 months after surgery



Case 3 - Results 6 months after surgery





Antero-inferior dislocation of the hip

References

1. Goddard MJ. Classification of traumatic hip dislocation. Clin Orthop. 2000 Aug (377): 11-4.

2. Pietrafessa Ca, Hoffmann JR. Traumatic dislocation of the hip. JAMA. 1983 Jun 24; 249(24):3342-6.

Brooks RA, Ribbans WJ. Diagnosis and imaging studies of traumatic hip dislocations in the adult. Clin Orthop. 2000 Aug (377): 15-23.
 Rodriguez-Merchan EC. Osteonecrosis of the femoral head after traumatic hip dislocation in the adult. Clin Orthop. 2000 Aug (377):68-77.

5. Sauser DD, Billimoria PE, Rouse GA, Mudge K. A review of the treatment of hip dislocations associated with acetabular fractures. Clin Orthop. 2000 Aug(377): 32-43.

6. Stein H. Computerized tomography for ascertaining osteocartilagenous intraarticular (slice) fractures of the femoral head. Isr J Med Sci. 1983 Feb; 19(2):180-4.

7. Poggi JJ, Callaghan JJ, Spritzer CE, Roark T, Goldner RD.

Changes on magnetic resonance images after traumatic hip dislocation. Clin Orthop. 1995 Oct(319): 249-59.

8. Vecsei V, Schwendenwein E, Berger G. Hip dislocation without bone injuries] Orthopade. 1997 Apr;26(4): 317-26

9. Yang RE, Cornwall C. Initial treatment of traumatic hip dislocations in the adult. Clin Orthop. 2000 Aug(377):24-31.

10. Canale A., Manugian St. Irreductible traumatic dislocations of the hip. J Bone Joint Surg Am. 1979 Jan;61(1):7-14.

11. Dreinhofetr KE, Schwarzkopf SR, Haas NP, Tscherne H., Isolated traumatic dislocation of the hip. Long-term results in 50 patients. J Bone Joint Surg Br. 1994 Jan; 76(1):6-12.

12. Hoiness P, Roisse O. Successful open reduction of a 5-monthold hip dislocation associated with a femoral head fracture. J Orthop Trauma. 2003 Feb;17(2):131-4..

13. Oni OO, Keswhani H. The treatment of old unreduced traumatic dislocations of the hip. Injury. 1984 Jan; 15(4):219-23.