Closed reduction of the traumatic posterior-dislocation of hip joint using a novel sitting technique

A case series

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Abstract

Rationale: Traumatic hip dislocation is a common joint dislocation. Delayed reduction has been shown to increase the risk of avascular necrosis of the femoral head. Most of the traditional methods must be performed under general anesthesia or spinal anesthesia to relax hip muscles. Anesthesia will prolong the interval between the injury and the reduction.

Patient concerns: 16 patients presented with hip pain and a leg shortened, flexed, internally rotated and adducted.

Diagnoses: X-ray and CT-scan showed acute closed posterior dislocation of hip.

Interventions: Closed reduction of the traumatic posterior-dislocation of hip joint using a novel sitting technique.

Outcomes: Among these 16 patients, 15 hips were successfully reduced using the Sitting Technique (table 1), indicating the success rate was 93.8\% (15/16). A total of 12 patients were followed up, with a mean period of 23.5 months (range, 6–72 months). Among these 12 patients, 10 patients (83.3\%) had excellent grade, 2 patients (16.7\%) had good grade.

Lessons: Sitting technique for treatment of traumatic posterior dislocation of hip joint does not need anaesthesia, which it shortens the interval between the injury and the reduction and saves valuable time for 6 hours of joint reduction. On the other hand, this method does no harm to the physicians' low back.

Abbreviations: AVN = avascular necrosis, CT = computed tomography.

Keywords: closed reduction, hip dislocation, reduction, traumatic

1. Introduction

Traumatic hip dislocation is a common joint dislocation, occurring between the femoral head and acetabulum. This dislocation accounts for 5\% of all traumatic joint dislocations.[1] Compared with anterior dislocation, posterior dislocation of the hip is more common. Traumatic hip dislocation usually results from high-energy injuries,[2] especially at the moment of traffic accident when the patient is riding on the front console but free from seat belts.[3] What makes us always depressed is not the dislocation itself, but the complications-avascular necrosis of the femoral head (AVN) and osteoarthritis. Currently, we have a variety of methods to reduce the hip joint, and even if all else of them fail, open reduction remains to be a good remedial measure. However, AVN and osteoarthritis are irreversible, and once the fuse is ignited, only arthroplasty can rescue the patients who suffer from hip joint pain no matter when they work or rest. Therefore, the key point to treat hip dislocation is how to prevent complications.

The incidence of AVN is closely related to the interval between the injury and the reduction.[4] Delayed reduction has been shown to increase the risk of AVN,[5,6] which is more than 50\% in patients who receive reduction 6 hours after the injury; in contrast, there is only 5\% in patients who are reduced within 6 hours.[7] Therefore, the initial treatment is critical to this injury. Most of the traditional methods must be performed under general anesthesia or spinal anesthesia to relax hip muscles; in other words, the traction force of the traditional technique is weaker compared with the strong muscles around the hip. Thus, application of these traditional methods is limited in the primary hospitals, which have no adequate equipment or skill for anesthesia and there is a shortage of physician in the department of emergency. Besides, anesthesia will prolong the interval between the injury and the reduction. Confronted with these problems, we have modified the Stimson technique to reduce the hip joint as soon as the patients were admitted to the department of emergency, especially in the primary hospitals.

2. Methods

This was a retrospective study, which was approved by the Institutional Ethical Board of the 3rd Hospital of Hebei Medical University. All patients gave their written informed consent. From April 2010 to December 2017, 22 patients diagnosed as

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traumatic posterior dislocation of hip were admitted at our department of emergency, and all the reduction procedures were done by a specific physician. Inclusion criteria were acute closed traumatic posterior dislocation of hip joint. Exclusion criteria were: open dislocation; old dislocation of hip joint; patient combined with blunt abdominal trauma or chest trauma; patient with incomplete medical or radiographic data. Eventually, 16 patients were retrieved. There were 13 males and 3 females, and their mean age was 40.3 years (range, 17–78). Among these patients, 6 were involved at right hips and 10 at left hips.

2.1. Technique

When the patient arrives at the department of emergency, most importantly, we should have a thorough physical examination to ensure the vital signs are stable and to exclude combined injuries. If we find a leg shortened, flexed, internally rotated, adducted, the X-ray and computed tomography (CT) scanings should be arranged. X-ray is used to diagnose the dislocation, and CT is used to assess the direction of dislocation and find out if there are fractures around the hip including loose body in the joint cavity.

After everything is ready, the procedure can be attempted. Patient lies prone on the examination table, and the inguen is against the end edge of the examination table, with the legs naturally dropping. One assistant holds the axilla and the trunk of the patient for stabilizing, so as to prevent the patient from sliding down during the reduction procedure. Surgeon sits down on the proximal part of the lower leg of the patient while the back is against the buttocks of the patient (Fig. 1). The surgeon uses his hands to grasp the ipsilateral ankle to keep the ipsilateral knee in 90° (Fig. 2). Using the lower leg as a lever, surgeon sits down on the proximal part of the lower leg. The gravity of physician works as the motive force of hip reduction, because this force is constant and strong enough to relax the hip muscles and reduce the femoral head. During this procedure, the surgeon has no superfluous movement and this technique does no harm to the surgeon's low back.

3. Results

Among these 16 patients, 15 hips were successfully reduced using the Sitting Technique (Table 1), indicating the success rate was 93.8% (15/16). Then we attempted to have all the patients followed-up. However, 3 patients did not have sufficient follow-up and 1 patient who failed to have his hip joint reduced using Sitting technique was not followed-up, either.

Finally, 12 patients were followed-up for an average of 23.5 months (range, 6–72 months). Functional outcomes were recorded during follow-up according to Harris Score. Among these 12 patients 10 patients (83.3%) had excellent grade, 2 patients (16.7%) had good grade. We had found one patient with AVN (8.3%), 2 patients with limited hip joint (16.7%) and one patient with osteoarthritis (8.3%) but no symptoms.

Figure 1. One assistant holds the axilla and the trunk of the patient for stabilizing, so as to prevent the patient from sliding down during the reduction procedure. Surgeon sits down on the proximal part of the lower leg of the patient while the back is against the buttocks of the patient.
4. Discussion

There are many methods to reduce the hip dislocation and have been described well in the literatures. Allis technique\(^8\) is one of the most widely used methods. Continuous traction is a big challenge for the low back of the physicians. Some experienced physicians commonly suffer from low back pain caused by lumbar disc herniation. In Stimson’s method,\(^9\) Continuous push is also a big challenge for the physicians and the push force is relatively weak compared with strong muscles around the hip. Herwig–Kempers provided a modified Stimson technique.\(^10\) The patient’s position is similar to the Stimson method. Although this method can be carried out without anesthesia, the traction force of this technique is neither stable nor sustainable; it’s hard to achieve reduction easily. In fact, our method is also a modified Stimson technique.

In our hospital, the preparation of preanaesthesia takes 2 to 4 hours on average. That will prolong the time of injury to reduction. The prime concern for closed reduction posterior hip dislocation without anesthesia is muscle relaxation. During reduction using Sitting technique, the gravity of physician works as the motive force of hip reduction. This force is constant and strong enough to relax the hip muscles and to reduce the femoral head, compared with traditional methods. Pain is the biggest problem that hinders reduction, especially during traditional procedures, because pain can cause muscular tone and hinder reduction. However, by Sitting method, the downward force is strong enough to relax the muscular tone. Moreover, the downward force of the Sitting method is a continual traction force rather than the sudden violence. The pain caused by the reduction is also relatively lighter and is usually tolerable. If there is a shortage of personnel, the physician can do it himself.

Some physician may suspect that this method will lead to the femoral neck or femoral intertrochanteric fracture or anterior dislocation, which is the major concern. However, in our practices, we have succeeded in reducing 15 patients by this method, and none of the patients suffers from the fracture. We suggested 2 primary advantages for this Sitting technique should be recognized. Firstly, although the traction force of this method is strong enough, the force is a continual traction rather than sudden violence. More importantly, there is no rotational force in this method, which is always the most common cause of the fracture. Secondly, protection of soft tissue around hip joint, especially the iliofemoral ligament and articular capsule makes it difficult for anterior dislocation or fracture with residual force.

With this technique, we are better able to sense the clicking sound and the movement of the reduction of the hip joint. It can be further confirmed by the achievement of flexion-extension and external–internal rotation of the affected hip. The postprocedure x-radiographs and CT scanning should be arranged to confirm the reduction, and the latter can find out if there is any fracture in the hip joint including loose body in the joint cavity. If fragments appear in the joint cavity before or after reduction, we will take measures according to the size of the fragments. For Pipkin Type 1, in which the fragment deviation or diastasis was less than 1.0mm, we choose conservative treatment. For small fragments or fragments was too small to be fixed, arthroscopic removal of
intra-articular fragments was a good choice.\textsuperscript{[11–14]} Open reduction and internal fixation is preferable when there is a nonconcentric hip reduction.\textsuperscript{[15]}

Meanwhile, in some cases this method is forbidden: dislocation of hip joint with ipsilateral femoral neck or intertrochanteric fracture; dislocation of hip joint accompanied by the fracture of ipsilateral tibia or femur shaft; ipsilateral proximal tibial amputation; instability or fracture of the ipsilateral knee joint; e. blunt abdominal trauma or chest trauma, and pelvic fracture with pelvic ring destruction.

For one patient suffering from ipsilateral proximal tibial amputation, the residual proximal tibial was so short that the physician could not sit on it, and other methods failed too, so we had to choose open reduction. We had found the reason why the Sitting technique failed to reduce the hip joint in one patient. This patient suffered from a traffic accident and had his hip joint

\begin{table}
\centering
\caption{Data collected from patient files (April 2010–December 2017) after implementation of Sitting technique.}
\begin{tabular}{|c|c|c|c|c|c|c|c|}
\hline
Age & Sex & Mechanism & Associated fractures and injury & Time before reduction, hours & Relocation method: & Notes \\
\hline
37 & M & Traffic Accident & Femoral head fracture & 5 & Successful & ORIF for femoral head fracture \\
\hline
52 & M & Traffic Accident & Femoral head fracture & 12 & Unsuccessful & ROM of hip 0–90° \\
\hline
58 & M & Traffic Accident & Femoral head fracture & 5 & Successful & ROM of hip 0–80° \\
\hline
52 & M & Traffic Accident & No & 4 & Successful & Removal of the avulsion fracture block \\
\hline
17 & F & Ski & No & 3 & Successful & Articular hip history \\
\hline
34 & M & Traffic Accident & No & 2 & Successful & \\
\hline
78 & M & Bending & No & — & Successful & \\
\hline
17 & M & Traffic accident & No & — & Successful & \\
\hline
23 & M & Traffic accident & No & 6 & Successful & \\
\hline
26 & M & Traffic accident & Acetabulum fracture & 4 & Successful & \\
\hline
46 & M & Traffic accident & Acetabulum + Femoral head fracture & 5 & Successful & \\
\hline
30 & M & Ski & No & 3 & Successful & \\
\hline
50 & M & Traffic accident & Acetabulum + Femoral head fracture & 5 & Successful & ORIF for acetabulum and femoral head fracture \\
\hline
23 & F & Skate & No & 6 & Successful & \\
\hline
55 & F & Traffic accident & No & 3 & Successful & \\
\hline
46 & M & Traffic accident & Femoral head fracture & 3 & Successful & \\
\hline
\hline
\textsuperscript{ORIF = open reduction and internal fixation.}
\end{tabular}
\end{table}

Figure 3. X-ray and hip CT scan showed that the femoral head was stuck in the posterior wall of the acetabulum.
dislocated, while accompanied with femoral head fracture. Hip CT scan showed that the femoral head was stuck in the posterior wall of the acetabulum (Fig. 3) and it could not be reduced by this method, either by other methods, so we had to choose open reduction eventually. Keel et al.[16] met a similar case as ours and they failed to reduce it by manipulative reduction and they chose open reduction at last.

The primary strength of our study is the application of a novel method to succeed in reducing the traumatic posterior dislocation of the hip joint. The second strength was the time we had followed up patients was relatively long, especially in one patient we had a follow-up of up to 7 years. The limitations of our study include relatively small sample size and the lack of a control group. Further studies with prospective randomized controlled trials are required to compare our method with traditional methods for treatment of traumatic posterior dislocation of hip joint.

5. Conclusions
The design of this method is smart. The gravity of physician works as the motive force of hip reduction, and this force is constant and strong enough to relax the hip muscles and to reduce the femoral head. The favorable outcomes of Sitting technique for the treatment of traumatic posterior dislocation of hip joint suggest that it is a worthwhile technique. Our technique does not need anaesthesia, which it shortens the interval between the injury and the reduction and saves valuable time for 6 hours of joint reduction. On the other hand, this method does no harm to the physicians’ low back.

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