# Is Arteriography Necessary for the Evaluation of Traumatic Knee Dislocation ?

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**Traumatic knee dislocation is associated with a high incidence of popliteal artery injury and may result in serious complications if there is a delay in treatment. Routine arteriography in evaluation of traumatic knee dislocation is still controversial. We reviewed 11 cases of traumatic knee dislocation from 1991 through 1997. One of the patients had a cold, pulseless limb with paresthesia. Arteriography revealed distal popliteal artery occlusion and the patient received operative therapy immediately. The others showed no evidence of ischemia at the time of admission. They received conservative treatment initially and were monitored by clinical examination without arteriography. All patients were observed for at least 72 hours in the hospital and no evidence of vascular injury was noted during their hospital stay. Regular follow-up was performed after discharge and none of the patients had any serious delayed complications. We conclude that careful physical examination and conservative treatment are adequate for managing most of the patients with traumatic knee dislocations. Arteriography is necessary only for patients with abnormal physical findings that indicate vascular insult on the distal extremities. ( Mid Taiwan J Med 1999;4:135-40 )**

**Key words**

arteriography, knee dislocation, popliteal artery injury

## INTRODUCTION

Traumatic dislocation of the knee, a relatively uncommon injury, is clinically important because it is associated with a high incidence of injury to the popliteal artery [1-4], which, if untreated, results in limb amputation in a high percentage of cases [2,5]. Dislocations of the knee are classified, according to the position of the tibia with respect to the femur, into five types: anterior, posterior, medial, lateral, and rotatory. Approximately 60% of dislocations are anterior or posterior. Absence of a gross dislocation when the patient is first examined at the hospital cannot rule out dislocation because complete knee dislocation may reduce spontaneously after hospitalization. A severely unstable knee in multiple directions is suggestive of spontaneously reduced knee dislocation, careful examination for instability of the knee in the emergency department is important [6]. The rates of vascular injury in patients with unreduced knee dislocations and those with reduced knee joints are similiar [6].

Limb loss is largely preventable if treatment is prompt and adequate. Factors contributing to the rate of limb loss include the degree of soft-tissue injury, development of infection, concomitant venous injury, preoperative ischemia, and a delay in diagnosis or misdiagnosis. Although some of these factors are not controllable, prompt diagnosis and treatment are factors surgeons potentially have the ability to control. Failure to or delay in recognizing popliteal artery

Received : November 14, 1998. Revised : December 30, 1998. Accepted : January 18, 1999.

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Table 1. Demographic data and clinical features in 11 patients with traumatic knee dislocations

| Case no. | Age | Sex | Side | Ischemia sign | Follow-up duration (Months) |
|---|---|---|---|---|---|
| 1 | 60 | M | Left | Absent | 10 |
| 2 | 60 | F | Right | Absent | 10 |
| 3 | 22 | M | Left | Absent | 6 |
| 4 | 25 | M | Right | Absent | 13 |
| 5 | 17 | M | Left | Absent | 5 |
| 6 | 42 | F | Right | Absent | 7 |
| 7 | 21 | F | Left | Absent | 11 |
| 8* | 47 | M | Left | Cold, pulseless | 11 |
| 9 | 63 | M | Left | Absent | 6 |
| 10 | 66 | F | Right | Absent | 5 |
| 11 | 44 | F | Right | Absent | 4 |

*Angiography showed occlusion of distal popliteal artery and then he received surgical intervention. M=male; F=female.

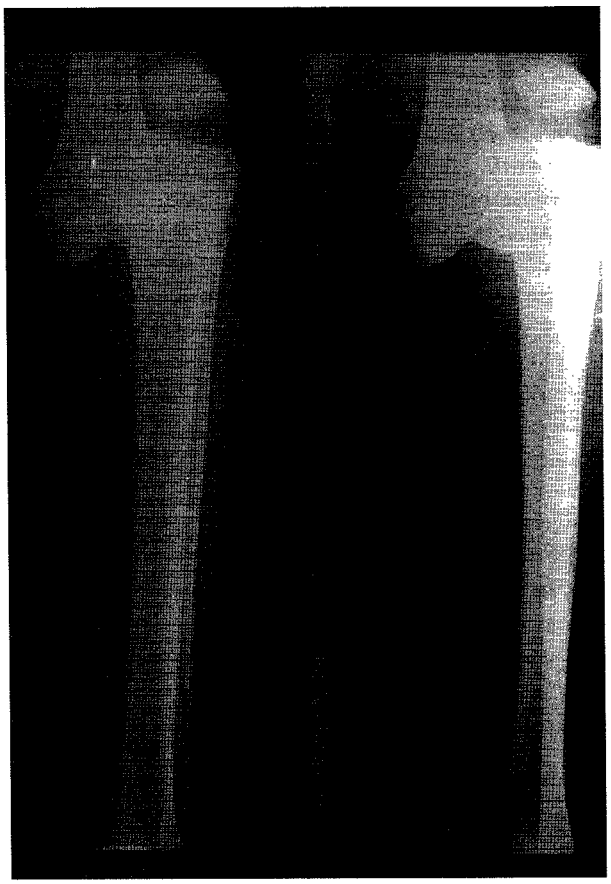

Fig.1 Roentgenogram showing anterior dislocation of the left knee.

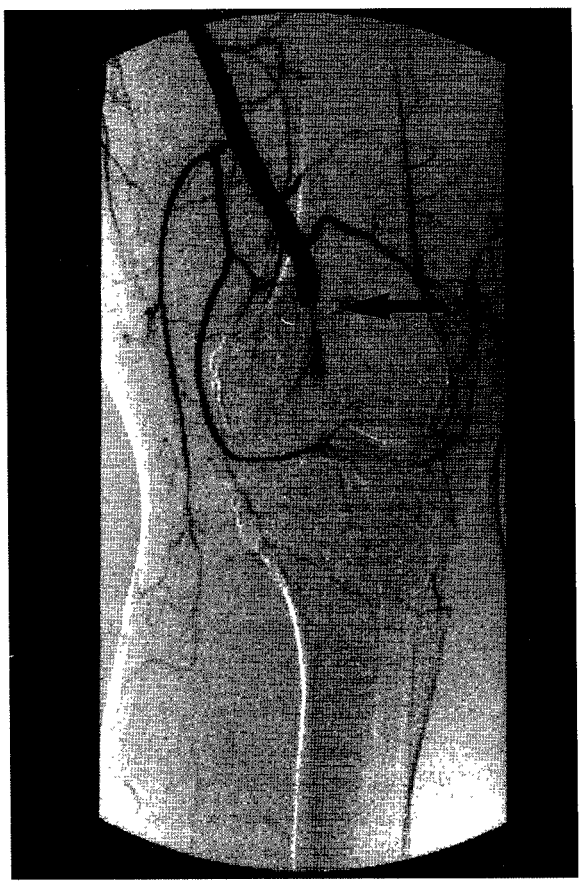

Fig.2 Angiography showing distal popliteal artery occlusion. There is an interruption on the popliteal artery at the level of the knee (arrow).

injuries and restore vessel continuity of flow after blunt trauma is a major cause of lower extremity amputation and morbidity [2,5]. A detailed and rapid assessment of neurovascular status of the lower extremity is of paramount importance. To avoid delayed diagnosis some surgeons advocate the routine use of arteriography in patients with knee dislocations to detect those with vascular injuries, regardless of the presence or absence

of clinical signs of arterial injury [1,7,8]. On the other hand, other authors have relied on physical examination to determine the therapeutic plan [3,9,10]. The issue of total reliance on physical examination versus routine arteriography is thus controversial. The purpose of this study was to assess the role of arteriography in patients with traumatic knee dislocations.

## MATERIALS AND METHODS

We retrospectively reviewed all admissions due to traumatic dislocation of the knee at the China Medical College Hospital from 1991 through 1997. Knee dislocation was defined as knees with gross dislocation or knees found to be grossly unstable with multiple ligament disruptions. In addition to physical examination, appropriate roentgenographic studies were also used for the diagnosis in patients with equivocal clinical findings. For patients with evidence of vascular injures (absence of distal pulses, paralyzed limbs, cold avascular limbs), arteriography was arranged. Patients who had angiographic findings of popliteral artery occlusion received emergent surgical intervention. Patients with normal physical findings on their distal limbs received conservative treatment and were observed in the hospital for a minimum of 72 hours.

## RESULTS

There were six men and five women with a mean age of 42 years (range, 17 to 66 years) enrolled for analysis (Table 1). Six injuries involved the left knee and five involved the right knee. Two dislocations were associated with fractures around the knee. All patients were hemodynamically stable and had no evidence of head or torso trauma. No patient had bruit, pulsatile hematoma, or cyanotic extremities. Ten of the patients had normal physical examination results (distal pulse, sensation, and motor function). The remaining one had a cold, pulseless limb with prolonged capillary refill and paresthesia, but the motor function was normal. Roentgenography showed anterior dislocation of the left knee (Fig. 1). Arteriography was immediately performed on that patient which showed distal popliteal artery occlusion of the limb (Fig. 2). Emergent arterial repair, fasciotomy and debridement were performed. The operative findings included thrombosis of distal popliteal artery, swelling and ischemic changes of all the compartments and partial necrosis of anterior and lateral compartments. Systemic anticoagulation therapy was used after the operation. After 11 months, the patient suffered from dropped foot, knee and ankle contracture and needed a cane while walking. None of the patients without evidence of ischemia at the time of admission received amputation and all could walk without any assistance; the range of motion of all 10 knees were within normal limits after 4 to 13 months of follow-up.

## DISCUSSION

In our study, distal pulse examination was a sensitive indicator of significant popliteal artery injuries following blunt popliteal trauma with knee dislocations. Patients with abnormal pulse should undergo diagnostic arteriography or exploratory surgery.

Owing to the great technical advances and improved general knowledge in vascular surgery, the amputation rates in patients with popliteal artery injuries have been decreased from 73% to 5% [3,9,11,12]. Since delay in reestablishing blood flow may result in irreversible ischemia within 6 to 8 hours, early diagnosis and repair of the popliteal arterial damage is the most important factor for improving prognosis. It has been reported that normal pulses, Doppler signals and capillary refill cannot detect early vascular injuries in patients with traumatic dislocation of the knees [13]. Some authors suggest that routine arteriography is needed to identify clinically occult vascular injuries that may cause temporally remote vascular compromise [8,13].

However, routine arteriography is not without complications. Femoral arterial puncture may cause local hematoma, intimal disruption with resulting dissection and limb ischemia, false aneurysm formation, and arteriovenous fistula [14]. Other complications included allergic reactions to radiocontrast media including urticaria, angioedema and airway obstruction, with or without cardiovascular collapse [15] and deterioration of renal insufficiency in patients with diabetes or impaired renal function [16].

Currently, the routine use of screening arteriography in the absence of signs of arterial injury is being questioned [3,9,10]. In most instances, the majority of injuries identified by arteriography in otherwise asymptomatic patients are small intimal defects, small pseudoaneurysms, or occlusion of noncritical vessels that may heal spontaneously with few untoward sequelae [3].

Therefore, some researchers have suggested that arteriography should be done on patients with abnormal physical findings for whom the incidence of arterial injury requiring surgery is 79% to 100% [3,9,10].

Only one of our cases received angiographic examination. This patient suffered from traumatic knee dislocation with ischemic signs and arteriography showed distal popliteal artery occlusion. Although emergency arterial repair, fasciotomy and debridement were performed, he finally suffered from dropped foot and knee and ankle contracture. Some investigators believe that arteriography is usually time-consuming and may delay emergent operation [3,14-16]. Our results demonstrated that abnormal peripheral pulses are highly predictive of arterial injuries and the evaluation using arteriography is questionable.

Patients who sustain knee dislocations and present with intact pulses and no signs of vascular injury may be successfully managed conservatively based on physical examination alone. Since delayed thrombosis may develop 24 to 36 hours following nonocclusive injuries [1,4], careful observation should be performed with consideration of delayed thrombosis. During this period, circumferential casting should be avoided to allow accurate neurovascular monitoring and for potential leg compartment constriction. Ten of our patients had normal physical examination results and received conservative treatment. None of these patients needed amputation and the resulting function and range of motion of their injured legs were within normal limits. Therefore, routine arteriography may be of minimal clinical benefit for patients with traumatic knee dislocation. Diagnostic arteriography is not necessary for patients with knee dislocations without abnormal clinical findings.

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# 動脈攝影在外傷性膝關節脫臼中是否必要？

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外傷性膝關節脫臼常伴隨著腘動脈損傷，如果延遲處理可能會導致嚴重的後遺症。例行性使用動脈攝影來評估腘動脈仍具爭議性。我們收集1991年到1997年間11個外傷性膝關節脫臼的病例。其中一個患者伴隨有患肢冰冷、脈搏消失、感覺異常。在動脈攝影中顯示出遠端腘動脈受損，並隨即接受外科手術治療。其餘患者並無缺血證據，這些患者最初接受保守性治療及使用臨床檢查來監控，並未接受動脈攝影。所有患者最少在醫院觀察72小時，而且住院期間並無血管受損的現象。在出院之後，所有患者經過追蹤檢查，並無任何延遲性的後遺症。我們認爲保守性療法及密切的理學檢查是外傷性膝關節脫臼最佳處理方式。若理學檢查顯示在遠端肢體並無異常徵候，靜脈攝影是不需要的。（**中台灣醫誌 1999;4:135-40**）

**關鍵詞**

動脈攝影，膝關節脫臼，腘動脈受損

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收文日期：11/14/1998　　修改日期：12/30/1998

接受日期：1/18/1999