

Popliteal artery injury in and about knee injury: An experience in Manmohan Cardiothoracic vascular and transplant center

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Abstract

Introduction: Knee dislocation is a common knee injury leading to neurovascular insufficiency. Penetrating injury to the popliteal fossa is also associated with neurovascular injuries. Amputation rate is high amongst popliteal artery injury associated with bone injury. Delayed detection and late interventions are the factors contributing for limb loss in these cases. We present our experience of the popliteal artery injury from a tertiary care center over the period of 3 years.

Method: It is a retrospective analysis of prospectively collected data of cases of popliteal arterial injury over the period of three years (July 2011 till June 2014). Data were analyzed on their demographic, clinical, management and outcome parameters with SPSS 17.

Result: There were total 35 popliteal artery injuries in 34 patients associated with injuries of knee. Twenty two (65%) patients were male and rests were female. Mean age of these patients was 23 ± 12 years, with age ranging from 15 to 76 years. Twelve patients had amputation and were identified and treated late. Most of the patients reach our center late mean time 9 ± 5 hours and as late as 7 days.

Conclusion: High index of suspicion is required to identify the popliteal artery injury in patients with injuries in and about the knee. Early vascular surgical consultation and intervention is required to alleviate its poor outcome.

Keywords: Knee injury, popliteal artery injury.

Introduction

Popliteal artery injury is usually associated with dislocation of knee. Incidence of the popliteal artery injury in and about knee injury is reported to be 20% in World War II and 25% in Korean War.¹ Amputation rate is high amongst patients with popliteal artery injury. Amputation rate were reported up to 72% in patients with popliteal artery injury with ligation during world war II,^{2,3} which has come dramatically down to less than 35% and even less in civilian injuries. The amputation rate has decreased in cases with penetrating injury to the popliteal artery but is relatively more in blunt injuries. McCabe et al.⁴, in a review of the literature, reported amputation rates of 8% for

injuries caused by penetrating trauma and 38% for those caused by blunt trauma. Amongst many factors associated with this high amputation rates in popliteal artery injury time between injury and treatment is most agreed factor by many authors. Popliteal artery injury detection is very low amongst many blunt injury of the knee. The sign and symptoms of the vascular insufficiency is masked by the pain and suffering of the knee injury itself in initial few hours. So high level of suspicion is required to identify and diagnose the popliteal artery injury in blunt injury of the knee. In penetrating injury the soft tissue and vessels are in focus and early diagnosis of the injury is relatively better as

compared to blunt knee injury where the bony injury carry away all the attention.⁵ Thus it is imperative that the early symptoms and signs of the vascular insufficiency should be looked for and treated urgently to prevent amputations specially amongst the blunt knee injury cases. In this study, we have retrospectively reviewed the popliteal artery injuries associated with fractures and dislocations about the knee. The purpose was to evaluate the treatment outcomes.

Methodology

It is a retrospective analysis of the prospectively collected data over a period of 3 years from July 2011 till June 2014 AD. this study was conducted in Manmohan Cardiothoracic Vascular and Transplant Center, Tribhuvan University Teaching hospital, Institute of medicine, Maharajgunj. The cases were initially evaluated by on duty medical officers and vascular team was called when vascular insufficiency is suspected. Orthopedics team was involved in all cases of blunt knee injury. The limb is assessed clinically and radiologically for distal vascularity. Orthopedics team fixes the bony, other soft tissue injury or the dislocations. Popliteal artery is explored and repaired with interposition of reversed great saphenous vein from contralateral limb or end to end anastomosis or simple suture repair as appropriate based on operative findings. After repair distal pulses were assessed clinically and in doubtful cases help of the Doppler was taken. Fasciotomy was done whenever required. Vascularity of the limb was assessed every hourly for 12 hours postoperatively and on daily basis then after till the time of discharge. Outcome was assessed in terms of the warm extremity, good capillary refill, good waveform in pulse oximetry and palpable dorsalis pedis & posterior tibial pulses. Other associated complications: neurological outcome, amputation and other morbidities were recorded. Informed consent from the patient was taken for enrollment in the study and ethical clearance was taken from Institutional review committee. Data obtained was entered in a preformed working proforma and was analysed SPSS 17 software.

Results

Thirtyfour patients with 35 popliteal artery injuries were included in this study with one patient having bilateral popliteal artery injury. These patients were of ages ranging from 15 to 76 years with mean age of 39.5 years. Twenty two (64.7%) patients were male and 12 female patients. Only 9 patients had surgery within 6 hours and all patients operated within 6 hours had good outcome. Blunt injury either in traffic accident or in the fall injuries were the most common etiological factor in causation of popliteal artery injury in this study. Etiology of the popliteal artery injury has been shown in Table 1. Contusion of the artery was the most common type of injury comprising 45.7% of all cases and other findings are listed in Table 1.

Table 1 Mechanism of injury and operative findings

Mechanism of injury		Operative findings		
		Contusion	Rent	Transection
Penetrating (n=8)	Gunshot (n=2)	1	0	1
	Others (n=6)	0	1	5
Blunt (n=27)	Knee dislocation (n=17)	12	0	5
	Road traffic accident with fracture (n=10)	3	3	4

There were associated fracture in 11(31.42%) patients and the dislocation in 17 (48.55%) patients. Twenty three patients attended other medical center before they were referred to us and 20/23 (86.9%) reached beyond 6 hours, and most of them were from outside the valley. There were 4 associated vein injury and 5 nerve injury. Operative techniques adopted for popliteal artery repair are listed in Table 2. Interposition of reversed saphenous vein graft (picture 1) was the most common operative modality adopted for popliteal artery repair. All the amputations were amongst the patients who reach hospital beyond 6 hours and were statistically significant with p value of 0.005. Preoperative color change and temperature were other statistically significant predictive factor of amputation with p value of 0.043 and 0.005 respectively. The rate of amputations amongst the penetrating injury is 25%(2/8) and 37.03% (10/27) amongst the blunt injury patients.

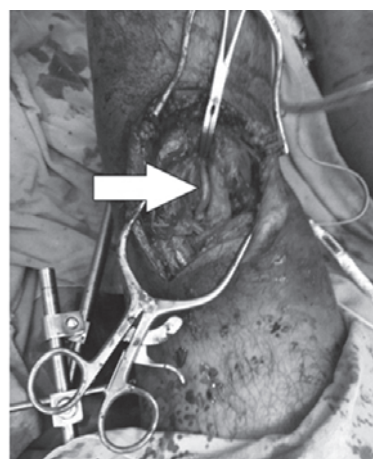


Figure 1 Intra operative picture of popliteal artery repair done with interposition reversed saphenous vein graft (arrowhead)

There was no perioperative mortality. There were total 6 patients with foot drop of them 5 are attributed to primary injury to the nerve that has been documented during primary procedure and foot drop in the remaining one patient is attributed to the compartment syndrome developed following reperfusion. Five limbs underwent primary amputation and remaining 7 limbs had secondary amputation, the overall amputation was 12/35 (34.28%). Twenty limbs (57%) had fasciotomy of which 16 had it during the primary procedure and 4 had it in post-operative period.

Table 2 operative procedures done based on operative findings

Operative findings	Operative procedure				
	End to end anastomosis	Vein interposition graft	Rent repair	Primary amputation	Total
Contusion	1	13	0	2	16
Transection	7	5	0	3	15
Rent	0	1	3	0	4
Total	8	19	3	5	35

Discussion

Popliteal artery injury is the most challenging injury to the vascular surgeon with very poor outcome in terms of limb loss and dysfunctions. Most of the series of popliteal artery injury are from the war era and are related to military sectors.^{2,3,6-11} Some reports have been published of popliteal artery injury in the civilian setup.^{5,12} This study presents the report of the popliteal artery injury mainly in civilian setup caused by traffic accidents or domestic injuries. Two cases of gunshot injury in this series are both accidental injury one case of self-inflicted injury during cleaning of the gun by a police man and second accidental shot by a team mate of a forest ranger.

Dislocation of knee are associated with a higher incidence of popliteal artery injuries.¹³⁻¹⁵ In this series there were 17 cases of knee dislocation, with an amputation rate of 5(29.41%) amongst them. This was, however, not statistically significant when compared with the rest of patients in the blunt group of injuries. Popliteal vascular injuries associated with skeletal injuries of the same limb pose a substantially higher risk for limb loss and morbidity than either injury alone.¹²

Delayed intervention is related to adverse outcome in vascular injury.¹³ In this study most of the patients were operated after 6 hours from the time of injury and amputation rate is highest amongst them with statistical significance. This late arrival to the hospital can be attributed to locality where the injury has occurred; in our series 28/34 (82.35%) patients were from out of valley and the delay in detection and referral as most of the patients 67.64% (23/34) in this series were referred from other hospitals. Though contusion with or without thrombosis is the most common finding in patients with popliteal artery injury in this series which

is a bit different from the reports of other civilian setup popliteal artery injury.^{5,12} Transection and the thrombosis are two mainly reported findings in such popliteal artery injury. Many authors¹²⁻¹⁵ associate operative findings to the final outcome of the popliteal artery injury, our study fails to show any such associations.

Primary amputation in popliteal artery injury is not uncommon especially amongst complex injury and who present late. Our series had 14.2% primary amputation for different reasons (3 for necrosis of muscle detected during fasciotomy and 2 mangled limbs). Seven limbs were amputated on later date after repair of popliteal artery. Of those four amputations were done for the muscle necrosis and rest for infection. Six (17.1%) patients developed foot drop among them 5 had primary nerve injury and one is attributed to the compartment syndrome. Four (11.4%) patients developed deep vein thrombosis of these 1 had popliteal vein repair and other 3 were thought normal during primary procedure. Most common complication in our series was surgical site infection which is compatible with reports of many other studies.^{6,10,16,17} Fasciotomy is advocated by many surgeons after vascular repair especially amongst patients who presents late, it has its own problems of prolonged hospital stay and wound infections.¹⁸ This finding was not the same in our series where infection is equally prevalent in groups with or without fasciotomy.

Conclusion

High level of suspicion, thorough vascular assessment, timely vascular surgery consultation and early intervention are the key for improvement of outcome in patients with popliteal artery injury in and about knee injury.

Conflict of interest: None declared.

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