



Significance of Mess Score in Upper Limb Vascular Trauma

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Abstract

Objective: To identify the significance of MESS score in patients with upper limb vascular trauma in a tertiary care institute.

Materials and Methods: Patient admitted at Rajiv Gandhi Government General Hospital, Chennai between 2014 to 2016 with trauma to upper limb presenting with associated acute limb ischemia due to vascular injury. During admission patients were selected for anatomic or extra anatomic bypass due to multiple reasons, mostly due to trauma of the extremity affecting the anatomical tunnelling site. A total of 20 patients underwent vascular repair with above indications. MESS score was calculated for all patients.

Results: Of the twenty patients limb salvage was possible in 18 of 20 patients. Primary graft patency at the end of 1 year was 80%. Early graft failure in 2 patients, late graft failure in 1 patient. anastomotic pseudoaneurysm was the result in 2 patients, 16 patients had functioning bypass at 1 year. Limb salvage was possible in 90% of patients. 2 patients had primary amputation.

Conclusion: In spite of the event of multiple factors rendering limb salvage impossible, appropriate and multidisciplinary approach to the patients presenting with acute limb ischemia in upper limb trauma with salvage of 90% limbs is even with high MESS scores. This signifies that MESS score is insignificant in upper limb vascular trauma.

Keywords : MESS score, extra anatomic bypass, limb salvage

Introduction

Combined arterial and skeletal extremity trauma imparts a substantially higher risk of limb loss and limb morbidity than do isolated skeletal and arterial injuries. DeBakey and Simeone documented this in WWII battle casualties, in which all injured arteries were ligated, reporting amputation in 60% of all combined injuries and 42% in isolated arterial injuries. Although McNamara and coworkers reported a substantial improvement in limb salvage from isolated arterial injuries in the Vietnam War, combined injuries still had a 10-fold greater rate of limb loss (23% vs 2.5%). These authors also documented a higher incidence of failed vascular repair among combined extremity injuries (33%) than among isolated extremity arterial injuries (5%). Romanoff and coworkers reported more than a 3-fold increase in limb loss in combined combat extremity trauma compared to isolated arterial injuries (36% vs 11%) in the hostilities in Israel [1]. This trend has continued into recent years in the civilian sector, even in the most experienced trauma centers, where amputation rates approaching 70% still are reported from combined arterial and skeletal extremity trauma, while less than 5% of limbs currently are lost following isolated arterial or skeletal trauma. Limb loss most commonly is attributed to delay in diagnosis and revascularization in most published series of this unique trauma. Major nerve damage, extensive soft tissue injury which disrupts

collaterals and prevents adequate vessel coverage, infection, and compartment syndrome are other reasons for such a high rate of loss of these severely compromised limbs.

MESS score is calculated for patients with lower limb trauma to assess salvagability of limbs. Patients with high MESS score (score > 7) most often end up in amputation whereas patients with scores < 7 have high chances of limb salvage. MESS score is highly predictable in deciding trauma patients for limb salvage or amputation.

This study identifies the significance of MESS score in upper limb trauma with vascular injury. Patients with vascular injury were revascularised with an autologous vein graft through anatomic or extraanatomic planes. This study was conducted in a tertiary referral centre for vascular surgery for the entire south India for vascular trauma patients. The procedures were done by well trained and experienced vascular surgeons in conjunction with Orthopedic and Plastic and Reconstructive surgery team of Rajiv Gandhi Government Hospital. Most of the patients with vascular trauma had extensive associated soft tissue and bone injuries for which more aggressive approach had to be taken to salvage their limbs. Vascular repairs were not left exposed. They were covered by a live and intact muscle flap or routed extra anatomic outside a massive destructed soft tissue region [2]. Bypass patency was assessed by presence of pulsation in the graft and recipient artery during physical examination.

Extra-anatomical bypasses are surgical procedures performed at sites that do not correspond to the natural anatomy.

The term extra-anatomic bypass refers to any bypass graft, autologous or otherwise that is placed in a site different from that of the arterial segment that is being bypassed [3]. The main objective of extra-anatomical bypass is to simplify a large surgical procedure, allowing a higher number of patients to be revascularized thereby salvaging an otherwise non-salvageable limb.

Materials and Methods

This is a prospective study done in Institute of Vascular Surgery (IVAS), Rajiv Gandhi Government Hospital (RGGGH), Chennai from January 2014 to December 2016. Patients presenting with acute limb ischemia (ALI) with upper limb trauma with vascular injury in the emergency department referred to IVAS for vascular repair are assessed for revascularization. Such patients who are amenable for revascularization with bypass but not through anatomic tunneling plane either due to infection or destruction of anatomic tunneling plane are planned for extra anatomic bypass with autologous vein. Extra anatomic bypass is defined as earlier. All patients presenting with ALI in trauma were assessed by MESS score. Primary amputation was avoided as much as possible. Those patients not amenable even for extra anatomic bypass were only proceeded with primary amputation.

A total of 20 patients with upper limb ischemia due to trauma were assessed for MESS score of which 18 patients underwent bypass with autologous vein graft in this period. All patients with ALI in trauma were operated within one hour of admission after resuscitation. The anesthesia used was general anesthesia or regional anesthesia in these patients. The vein used for graft was reversed saphenous vein in all cases harvested from ipsilateral leg. Damage control resuscitation with permissive hypotension, minimal crystalloid, and early fast warmed blood transfusion were employed. Multidisciplinary approach by a team of vascular, orthopedic and plastic surgeons was used to minimize ischemic time, set treatment priorities, determine the need for a temporary shunt, and allow for quick and meticulous vascular repair. Incisions typically are made longitudinally, directly over the target vessel proximal and distal to the injury to ensure adequate exposure for proximal and distal vascular control and repair. Intraoperative systemic heparin (5,000 units) was routinely administered after a proximal control was achieved, prior to arterial cross clamping, except in cases of excessive bleeding due to other, non-vascular injuries. Proximal anastomosis was fashioned either end to side or end to end depending on the site and nature of vessel injury. The bypass planes used were intramuscular or subfascial planes in all cases. The bypass graft was given a suitable cover with a native muscle and fascio cutaneous flap or local rotation flap or abdomino thoracic cross over flap if necessary by plastic surgery team. Bone stabilization was done with external fixation.

All patients were managed in post op ICU and were treated with broad spectrum antibiotics (piperazillin + tazobactam 4.5 gm or cefoperazone + sulbactam 1 gm) and inj. Metroglol 500 mg tds initially in post operative period. Culture specific antibiotics were given accordingly later. Post operatively patients were monitored for palpable pulses in operated limbs. If pulses were not palpable graft function was monitored by ABI or Doppler signals in the extremity. Open fasciotomy was liberally done for all cases of combined arterial and venous injury or for ischemia of a longer than 6 hours. Following operation, Clexane (40–80 mg) intravenous heparin was administered daily to prevent thromboembolic event in a non-mobile trauma patient. This was discontinued as the patients became ambulant. Post operatively patient was discharged with low dose aspirin (75 mg) and followed up monthly for graft patency, functional improvement and wound healing.

2 patients had extremely mangled extremity with delayed presentation beyond 24 hours. These patients presented with preset gangrene of extremity which was non-salvageable, hence proceeded with primary amputation as a life saving measure.

Mess Score

Skeletal /soft tissue injury	
Low energy (stab; simple fracture; pistol gunshot wound)	1
Medium energy (open or multiple fractures, dislocation)	2
High energy (high speed MVA or rifle GSW)	3
Very high energy (high speed trauma + gross contamination)	4
Limb ischemia	
Pulse reduced or absent but perfusion normal	1*
Pulseless; paresthesias, diminished capillary refill	2*
Cool, paralyzed, insensate, numb	3*
Shock	
Systolic BP always > 90 mm Hg	0
Hypotensive transiently	1
Persistent hypotension	2
Age (years)	
< 30	0
30-50	1
> 50	2
* Score doubled for ischemia > 6 hours	

Results

Most of the patients operated in the study were male (18) compared to female(2) with a male to female ratio of 9:1 and most of them were less than 30 yrs. All except 2 had no co - morbidities such as Diabetes , Hypertension or Coronary artery disease . Almost all of the patients had associated bone or nerve or muscle injury , hence most of them were operated by a multidisciplinary team of vascular , orthopedic and plastic surgeons. Bone injuries were managed with external fixation, nerve injury was managed by primary repair and muscle injury was managed with thorough wound debridement and myoraphy. Time of presentation to hospital was mostly beyond 6 hrs and few of them presented beyond 24 hrs . MESS score was calculated for all of them eventhough MESS score[4] was formulated for lower limb injury , it can be applied to upper limb injuries. Patients with MESS score of more than 7[5] are usually considered for primary amputation but in this study most of the patients had MESS score of more than 7. Out of 20 patients 14

patients had MESS SCORE >7 of which 12 patients limb were salvaged.They were considered for limb salvage because the injuries were of the upper limb and because of high collateralization of upper limb, limb salvage is a high possibility for all these patients. Moreover these patients were manual labourers of low socioeconomic group who are not affordable for high end prosthesis and were dependant on their native limbs for their day to day living . Giving them even a semifunctional limb is much better than an amputated limb for these patients.

Post op wound infection was found in 6 patients which was managed with culture specific antibiotics and thorough wound debridement. 2 of the 6 patients had anastomotic pseudoaneurysm and presented with anastomotic blowout in immediate postop period for which ligation of native vessel and graft explantation was done . These patients were managed with systemic heparinisation. Primary amputation was done in 2 patients as descrbed earlier for which both patients had a above elbow amputation as the limbs were nonsalvagable. One patient presented with late graft failure after 6 months but limb was not threatened because of collateralization and wound had healed by then . Primary patency (intervention-free access survival) was defined as the interval from time of access placement to any intervention designed to maintain or reestablish patency or to access thrombosis or the time of measurement of patency. Primary patency of the graft in our study group was 80 % and limb salvage was 90 % .

PREPROCEDURE



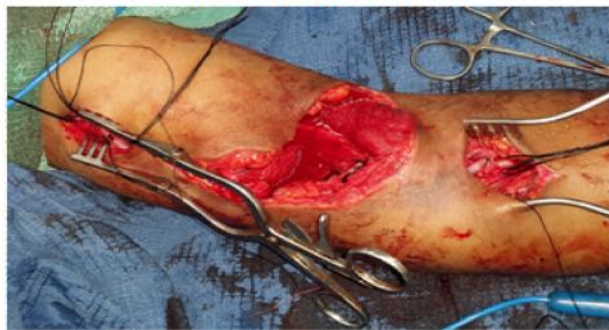
POST PROCEDURE



BRACHIO RADIAL BYPASS



BRACHIO BRACHIAL BYPASS



Discussion

Nowadays, with the development of endovascular surgery, due to enhancement in technique and equipment, improvement in clinical and anesthetic management of patients who are able to perform classical surgery and with better control of infections, extra-anatomical bypass has become an exception surgery. Despite its indication having become more restricted, it is still a technique of great value in our country, especially due to economic restrictions of endovascular procedures used and increasingly higher number of patients presenting with acute limb ischemia in trauma associated with skeletal or musculofascial injuries and with multiple comorbidities.

From a pathology standpoint, there are 5 types of vascular injury: (1) intimal injury (flaps, disruptions, or subintimal and intramural hematomas), (2) complete wall defects with pseudoaneurysms or hemorrhage, (3) complete transections with hemorrhage or occlusion, (4) arteriovenous fistulas, and (5) spasm.

Intimal defects and subintimal hematomas with possible secondary occlusion are associated most commonly with blunt trauma, whereas wall defects, complete transections, and arteriovenous fistulas usually occur with penetrating trauma. Spasm can occur after either blunt or penetrating trauma to an extremity and is more common in young patients. Physical examination findings are classified into hard or overt signs and soft signs of vascular injury. Hard signs of extremity vascular injury include massive bleeding, a rapidly expanding hematoma, any of the classic signs of arterial occlusion (ie, pulselessness, pallor, paresthesia, pain, paralysis, and poikilothermia), a palpable thrill, or an audible bruit. The incidence of

vascular injuries in patients with any hard sign is consistently greater than 90%. When hard signs of injury are present, there is limited need for imaging diagnostic tests, such as computed tomography (CT) or conventional angiography, which take extra time and may provide findings that cloud decision making 9.

In contrast, in these cases, immediate operation on the injured extremity is necessary, generally with exploration of the injury site with wide exposure to enable vascular exploration and repair. In the patient with other acute life-threatening injuries, such as an intracranial hematoma with midline shift, bleeding to the chest, abdomen, or pelvis, gastrointestinal contamination in the abdomen, and simultaneous trauma in 2 extremities, 1 operative team should manage the life-threatening injury elsewhere, and a second team should control bleeding and reestablish perfusion, preferably with a temporizing measure, such as a temporary intravascular shunt. If a hard sign is present, except if an expanding hematoma or external bleeding, localization of the defect is necessary prior to incision.

In our study most of the Patients presented delayed beyond 6 hrs with absent peripheral pulses and delayed capillary refill time associated with a bone, nerve and muscle injury. Most of the patients had a MESS score of more than 7 but limb salvage was possible in most of them. This was due to the untoward effort of the multidisciplinary team and post op care. The mainstay of diagnosis of vessel injury in our study was based on clinical assessment and hand-held Doppler examination. We believe that angiography remains an effective method for diagnosing the vascular lesions, but it is also a time-consuming procedure, especially in traumatic vascular injuries requiring prompt surgery. Additionally, preoperative angiography did not offer any benefits in patients with obvious arterial injury. Angiography may be useful, especially in patients with multiple sites of potential vascular injury [8]. CT angiogram or on table angiogram were not performed for our patients because of nonavailability of 24hr CT imaging or hybrid OT suite in our centre and site of vessel injury was diagnosed by hand held

Doppler assessment most often. Intra op arterial shunting was done if necessary before bone stabilization. Wound cover was given with native tissue or local rotation flaps or occasionally by abdominal or thoracoepigastric flap which was divided after 4 weeks [9]. Patients were encouraged to do passive and active physiotherapy after post op recovery.

Eventhough this study has few limitations like small sample size, all bypass in trauma was done in upper limb this study establishes that bypass with autologous vein graft is a viable option to salvage the limbs even with MESS score > 7 and ischemia beyond 6 hrs.

Conclusion

We conclude that salvage of upper limb with anatomical or extra-anatomical bypass should remain as a surgical option, for all cases of vascular injury in upper limb trauma eventhough MESS score is > 7. This study establishes that MESS score is unreliable in upper limb vascular trauma as patients with score > 7 can have their limb salvaged with an early meticulous dedicated multidisciplinary approach to the patients. No conflict of interest .

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