RESEARCH ARTICLE

An outcome of emergency vascular surgery performed by general surgeons; our experience in a university hospital of Pakistan and can they substitute vascular surgeons?

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Abstract

Objective: To measure the outcome of emergency vascular surgery performed by general surgeons, and to identify preventable causes of mortality.

Method: The retrospective study was conducted at the General Surgery Department of Mayo Hospital, King Edward Medical University, Lahore, Pakistan, and comprised data between January 2014 and May 2019 related to cases regardless of age and gender that required emergency vascular surgery after diagnosis by a consultant surgeon at the surgical emergency. The cases were analysed from admission till discharge. Data was analysed using SPSS 20.

Results: Of the 135 cases, 127(94%) were males. The overall mean age was 28.8±11.5 years (range: 14-63 years). Mean duration of hospital stay was 11±3.92 days (range: 4-22 days). Three major peripheral arteries injured were brachial 32(38.5%), popliteal 55(40.7%) and femoral 20(20.7%), with more than half with complete transection 75(55.6%). Vascular repairs done were primary anastomosis 45(33.3%), reverse saphenous vein graft 68(50.4%), embolectomy 4(3%) and amputation 18(13.3%). Limb salvage rate and mortality was 101(74.8%) and 6(4.4%), respectively. Complications occurred in 38(28.1%) cases, with 24(18%) wound infections and 9(6.7%) myonecrosis. Factors leading to poor outcome/complications were Glasgow Coma Scale score <12 (p=0.01), referred case (p=0.04), significant bleeding (p=0.004), haemoglobin <9 at presentation (p=0.001), bone fracture (p=0.01), involvement of lower limb (p=0.003) and late presentation (p=0.003).

Conclusion: Late presentation in hospital was the major modifiable factor improvement of which could lead to better outcome, apart from the early and proper surgical intervention.

Keywords: Vascular surgery, Artery repair, Venous graft, Vascular anastomosis. (JPMA 72: 1497; 2022)

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Introduction

Globally, more than 234 million major operations are performed annually and despite the burden of disease more than 2 billion people are expected to be beyond surgical care access, and majority of them are from low- and middle-income countries (LMICs). Delay of hours, even minutes, can be hazardous and potentially life-threatening in case of the patient requiring emergency vascular surgery. The increasing cases of firearm injuries and invasive medical/surgical procedures have increased the incidence of vascular injury in the United States alone. Besides, road traffic accidents (RTAs), natural calamities and civil wars have also caused an increase in cases worldwide.[1-3]

Besides, high-speed motor vehicle accidents, industrial hazards, street crimes, terrorist activities have also contributed to the excessive burden of vascular surgeries in regions where there is no proper vascular surgery training institution and programme to manage such huge number of cases.[4,5]

The proportion of general surgeons pursuing fellowship training has increased from >55% to >70% since 1992. The introduction of fellowship opportunities in newer content areas as sub-speciality is increasing day by day. The number of vascular applicants with the United States medical degrees decreased by 36% from 107 in 1997 to 68 in 2004[1]. The number of training positions available in vascular surgery programmes accredited by the Accreditation Council for Graduate Medical Education has increased by 34% but the total number of active applicants to these programmes has decreased by 21%. In the 6th most populous country, with over 200 million people, Pakistan has only four vascular surgery programmes, and that explains why general surgeons are handling vascular surgery cases as well.[4,6,7]

Escalating numbers of vascular surgical cases in the growing elderly population also adds to the burden of vascular surgery in Pakistan. But data shows 62% higher mortality rate when the vascular surgery was performed by a general surgeon rather than a vascular surgeon.[5,8]

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Acute myocardial infarction (AMI) and death occur within the first 30 days after a major vascular surgery, and the associated chief events are postoperative infection, venous graft rejection/removal, higher incidences of amputation and sepsis. Methicillin-resistant staphylococcus aureus (MRSA) has emerged as the leading cause of postoperative infection in vascular surgery patients, but there were no higher incidence of morbidity or mortality except for increased length of hospital stay when compared to patients with methicillin-susceptible staphylococcus aureus (MSSA).[9-11]

Vascular and cardiac surgeons handle significant number of cases, and, as such, vascular operations performed by them are naturally expected to have better outcomes. In contrast, general surgeons have to build up proficiency in many other surgical procedures, and, as a result, they have minimal time to expand skill in vascular procedures.[8] In Pakistan, general surgeons share the surgical workload with a minimal number of vascular/cardiac surgeons. The current study was planned to measure the outcomes of emergency vascular surgery performed by general surgeons, and to identify preventable causes of mortality.

Materials and Methods

The retrospective study was conducted at the General Surgery Department of Mayo Hospital, King Edward Medical University, Lahore, Pakistan, and comprised data between January 2014 and May 2019 related to cases regardless of age and gender that required emergency vascular surgery after diagnosis by a consultant surgeon at the surgical emergency. Data was extracted from the departmental record system using simple consecutive non-probability sampling technique, and related to cases who had emergency vascular exploration and repair, and those who required emergency vascular surgical intervention admitted through the General Surgical Emergency Department (GSED). Data of patients who required emergency vascular surgical intervention admitted through departments other than GSED who had been referred to the Cardiac or Vascular Surgery departments per-operatively or postoperatively was excluded.

All these cases had been done after pre-anaesthetic evaluation and getting fitness for general anaesthesia (GA) from the Department of Anaesthesia. All the surgeries had been done by consultant surgeons or under the direct supervision of consultant surgeons of the General Surgery Department.

Data was assessed for associated bleeding disorder, coagulation disorder and other associated medical or surgical illness.

Data was analysed using SPSS 20. Qualitative variables were expressed as frequencies and percentages, while quantitative variables were presented as mean and standard deviations. Categorical data was analysed using chi-square test and student's t-test. Fisher's exact test was used when applicable. $P<0.05$ was considered statistically significant.

Results

Of the 135 cases, 127(94%) were males. The overall mean age was 28.8+11.5 years (range: 14-63 years). Duration of injury was 30-60min in 34(25.2%) cases, and the mean Injury Severity Scale (ISS) score was 17±0.59, while the Glasgow Coma Scale (GCS) score at presentation was 9-12 in 73(54.1%) cases. Aetiologies leading to emergency presentation was RTAs, indicating blunt trauma, in

Table-1: Various parameters related to patients who underwent vascular surgical procedures.

Duration of injury	<30min	8	5.9
	30min to 1 hour	34	25.2
	1 hour to 3 hours	33	24.4
	3 to 6 hour	25	18.5
	6 to 12 hour	19	14.1
	>12 hour	16	11.9
Mode of presentation	Referred Case	61	45.2
	Local City Population	74	54.8
Injury Severity Score (ISS)	Mean ± SD	17±0.59	
Vessel Injured	Brachial Artery	52	38.5
	Femoral Artery	28	20.7
	Popliteal Artery	55	40.7
Type of injury	Complete transection	75	55.6
	Partial Transection	38	28.1
	Intimal Injury	15	11.1
	Spasm	7	5.2
Associated injuries	Soft Tissue Only	38	28.1
	Soft Tissue + Bony Fracture Only	58	43.0
	Soft Tissue + Venous Injury	6	4.4
	Soft Tissue+Bony Fracture+Vein	20	14.8
	Soft tissue +Bony Fracture+nerve	5	3.7
	Soft Tissue +Vein+Nerve	4	3.0
	Soft Tissue +Bony Fracture +Vein +Nerve	4	3.0
Concomitant body injured	Abdomen+Pelvis	9	6.7
	Thorax	8	5.9
	Head and Neck	5	3.7
	Polytrauma	15	11.1
Haemoglobin on Presentation	>12g/dl	7	5.2
	10-12g/dl	36	26.7
	8-9g/dl	66	48.9
	<8g/dl	26	19.3
GCS at presentation	Mean ± SD	12.2 ± 2.1	
	<9	4	3.0
	9-12	73	54.1
	13-15	58	43.0

SD: Standard deviation, GCS: Glasgow Coma Scale.

Figure-1: Reverse saphenous vein graft (RSVG) of femoral artery.

Table-2: Vascular surgical procedures and their outcomes.

Surgical Procedure Done	Primary Anastomosis	45	33.3
	RSVG	68	50.4
	Primary Amputation	18	13.3
	Embolectomy	4	3.0
Adjuvant Extremity Surgery	External Fixator of Bone	14	10.4
	Vein Ligation	18	13.3
	Vein Repair or Graft	6	4.4
	Nerve Repair	12	8.9
	POP cast	3	2.2
	Debridement Only	53	39.3
	Ext.Fixator+Vein Ligation	24	17.8
	Ext.Fixator+Vein Repair		
	Nerve Repair	5	3.7
Fasciotomy	No	65	48.1
	Yes	70	51.9
Complication after surgery	Wound Infection	24	17.8
	Myonecrosis	9	6.7
	Graft Failure	4	3.0
	Bleeding/Hematoma	1	.7
Limb salvage	Limb Salvaged	101	74.8
Amputations	Amputated (Primary + Secondary)	34	25.2
Patient outcome	Discharged	129	95.6
(mortality)	Expired	6	4.4
Mean Hospital stay in days	11±3.92	range: 4-22 days	

RSVG: Reverse saphenous vein graft, POP: Plaster of Paris, SD: Standard deviation.

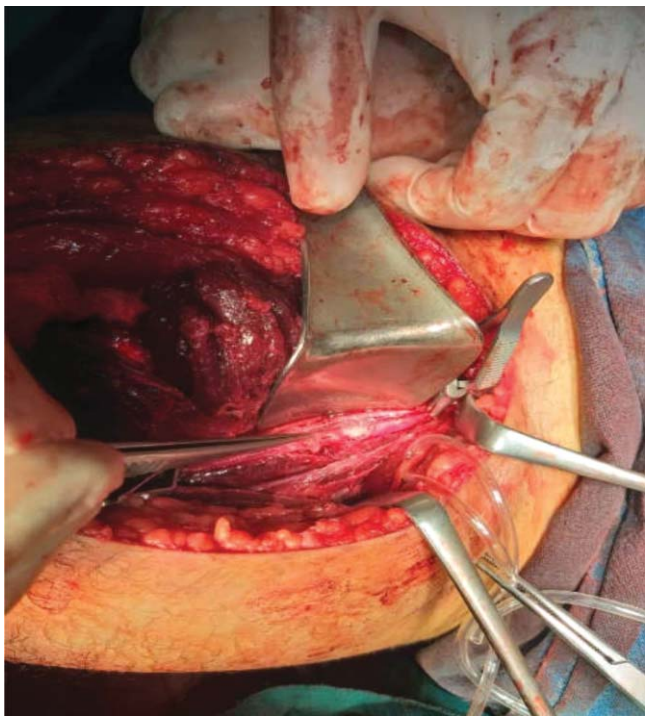

Figure-2: Rent in femoral artery.

7656.3% cases, 26(19.3%) had gunshot/firearm wounds, indicating penetrating injuries, and 33(24.4%) had sharp object injuries.

Three major peripheral arteries injured were brachial 32(38.5%), popliteal 55(40.7%) and femoral 20(20.7%) as shown in Figures-1 and 2, with more than half with complete transection 75(55.6%). Vascular repairs done were primary anastomosis 45(33.3%), reverse saphenous vein graft (RSVG) 68(50.4%), embolectomy 4(3%) and amputation 18(13.3%). Limb salvage rate and mortality was 101(74.8%) and 6(4.4%), respectively (Table-1).

Complications occurred in 38(28.1%) cases, with 24(18%) wound infections and 9(6.7%) myonecrosis. Among 6(4.4%) patients who expired, 3(12.5%) mortalities were in the wound infection group, 1(11.1) was in the myonecrosis group, and 2(50%) were in the graft failure group (Table-2).

Factors leading to poor outcome/complications were

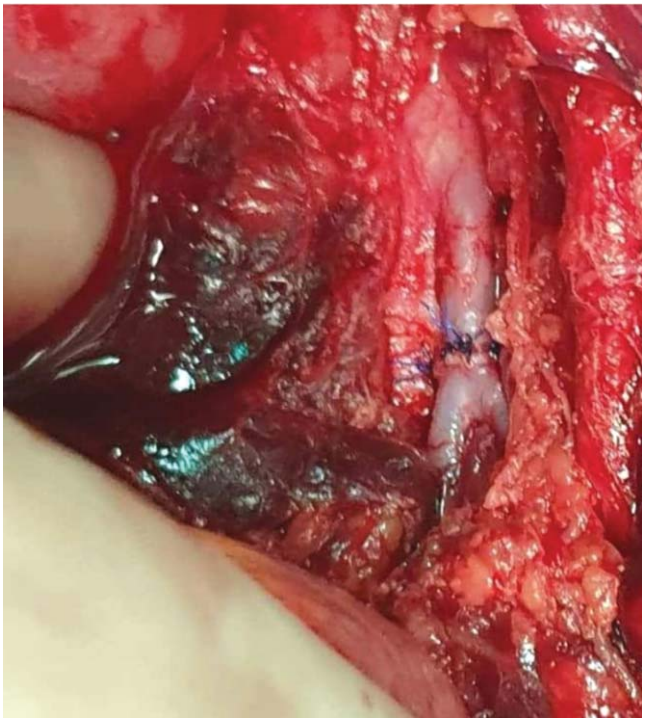

Figure-3: Repair of superior mesenteric artery (SMA).

Glasgow Coma Scale score <12 (p=0.01), referred case (p=0.04), significant bleeding (p=0.004), haemoglobin <9 at presentation (p=0.001), bone fracture (p=0.01), involvement of lower limb (p=0.003) and late presentation (p=0.003).

Data regarding the experience and skills of general surgeons who performed these vascular repairs showed that 2/3rd (n=12/18) of them had experience >2 years post-specialisation/fellowship. All of the surgeons (n=18) were of ages 30-40 years. Among them, 91% (n = 16/18) showed interest in performing vascular surgeries, and these included surgeons who had just completed their fellowship exam and had assisted many vascular procedures with the seniors.

Discussion

The current study planned to determine the outcomes after arterial repairs done by general surgeons, and to study factors leading to complications.

A 12-month study reported that 79% of the consultations needed urgent vascular repairs, including ischaemia cases of the limbs, aortic disease and some iatrogenic injuries.[12]

A local study reported after collecting data from 21 non-vascular surgeons that only 14% had exposure of vascular repairs. A workshop was conducted and knowledge was assessed. Gain in knowledge was seen in 21% participants.[13]

Most studies based on structural measures considered the introduction of a clinical pathway or a registration system. Reports based on process measures showed promising results. Outcome as clinical indicator mainly focussed on identifying risk factors for morbidity, mortality or failure of treatment.[9]

In another study, data of vascular surgeries done in emergency from 2005 to 2010 was analysed. It concluded that the outcome of these surgeries was significantly related to the skill of the surgeon, and mortality and worsening morbidity was easily predicted.[10] Another study[14] reported that among the patients with vascular injuries requiring repairs, around 25% had popliteal injuries and the majority were males, which are similar to the results of the current study.. Overall mortality in the study was 8.5%.[14] The current study had better outcomes.

Similar to the current results, a study[15] reported that vascular repairs after popliteal injuries were mostly due to blunt injury in 55%, penetrating in 45% cases, and the amputation rate was 28%, with more than 80% in blunt trauma cases. These findings were close to those in the current study. Analysis of follow-up data after one year showed that 35% cases had limitation in activity.[15]

The most common cause in a study was firearm injuries (97.5%), while the rest stab injuries (1.5%) and blunt trauma in <1% cases. Majority cases were young males (86%). End-to-end anastomosis was done in two-third of the cases, RSVG in 8%, poly tetra fluoroethylene (PTFE) 4.5%, embolectomy 1.8% and ligation in 7%. In cases with fractures, external fixators were applied in 29% patients; fasciotomy was done in 15%; and amputation was done in 19% due to extensive injuries and delay in the presentation in emergency, with overall mortality 4.7%.[16]

In one study, penetrating injuries were seen in 73% and blunt in 27% cases. Only 1 patient had primary amputation. Among the patients with vascular repairs, 4% cases had major and minor amputations with no mortality.[17]

Another 5-year study showed results similar to those of the current study.[18]

A study showed data of 81 patients with mean age 28.6±14.5 years. Partial laceration was the most common arterial injury (64%) with venous grafting the common repair done (60%), fasciotomy done in more than half of the cases (68%). The limb salvage rate was 82.7% and amputations were more in blunt trauma patients, while mortality was 8.6%.[19] These results were also close to those of the current study.

One study analysed data of 36 cases of arterial injuries with a mean age of 28.4±10.3 years having over 89% male patients. The most common cause was gunshot injuries (37.8%), followed by assault (27%). Mean time of presentation was around 20 hours, and 64% cases presented within 12 hours. The overall limb salvage rate was 65% and those with presentation after 12 hours had poor outcomes.[20]

In one study comprising patients of vascular repairs done by general surgeons reported that the exposure of vascular repairs of general surgeons was decreasing with advancement in the healthcare system.[21] Training and practice of vascular repairs of general surgeons working in the emergency departments are important to improve surgical skills. Vascular surgeons cannot be consulted on every vascular injury in emergency situations. With the involvement of skilled general surgeons in such cases, mortality can be reduced with better limb salvage rate owing to early intervention.

Conclusion

The outcomes of vascular repairs done by general surgeons can be further improved with better exposure to such cases. With recent advancement in the healthcare system, the general surgeons should improve their skills to perform vascular repairs in order to act as substitutes to vascular surgeons when and where needed.

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