This important report from northern India details a single center experience in Jammu and Kashmir with treating traumatic vascular injury. This 3-year experience with 25 patients isn’t necessarily unique regarding incidence of injury, anatomic distribution and injury mechanism during conflict, however, it emphasizes several features in managing these patients and it resonates due to its location and catchment region. Obviously, this is a geographic area where significant battles and wartime injury occur, yet many challenges to surgical care exist. Perhaps the most important of these is the required transport times to definitive treatment and potential delays therein. The authors note that time from injury to hospital arrival in their cohort was 7 hours on average. This is certainly a formidable obstacle to managing arterial injury and speaks to the importance of pre-hospital standardization, regional trauma systems and pathways particularly in areas where terrain is a major adversary.

All can understand that even in the best of circumstances such delay tests the best of surgical teams. Indeed, in a porcine model, 5 hours was identified as the ischemic interval after which neuromuscular recovery was significantly diminished. This threshold in the presence of hemorrhagic shock is shortened even further. The importance of early restoration of perfusion to functional outcome led us to study and develop a posture of early temporary vascular shunting (TVS) during operations in Iraq and Afghanistan. This has infiltrated civilian practice with TVS used during bony fixation, vein harvest, and/or damage control in the critically injured. Only one of the 25 patients in this experience had a shunt placed. The authors ability to achieve an 8% amputation rate in the face of this delay is admirable, and frankly, remarkable.

Aside from issues surrounding transport delay and early restoration of perfusion, the authors discuss the importance of assessment for combined arterial and venous injury and fasciotomy need. They approached each judiciously. The importance of fasciotomy is clear both in terms of limb salvage and mortality. Delay in fasciotomy or need for revision has been shown to not only lead to worse limb outcomes but has a negative effect on survival. The authors performed fasciotomies in 13 of 25 (52%) with 2 secondary amputations and one death in the cohort. Again, a remarkable outcome for such a challenged injury group. The dictum that fasciotomies should generally be done in extremity vascular injury holds, and we have been proponents due to limb and life impact, yet clearly the authors support the point a select approach can be successful.

The group from Jammu and Kashmir also uphold the generally held posture of select venous repair versus ligation in combined injury. Civilian series of vein injury have largely shown no objective benefit to repair over ligation. Yet, our posture has been aggressive with wartime combined arterial and venous injury due to the significant, five-time reduction in amputation noted in our assessments when vein repair was performed. This led to development of a triage platform for combined arterial and venous injuries in extremity vessels, yet many caveats exist. These include the precedence of other life-threatening injuries, and the degree of associated bony and soft tissue destruction which also destroys venous collaterals. In fact, while true objective data do not exist, temporary shunting of venous...
injuries has also been identified as a viable option in combined injury and we have incorporated this into consideration also.\(^2\) We have also considered and performed delayed venous repair after ligation if this is able to be accomplished within 24 hours of initial management.\(^3\) The late outcomes are unclear with this technique\(^6\) but ostensibly the initial decompression provided in multi-system extremity injury has been impressive. Admittedly, the relevance of this triage tool and operative repair strategies to many, if not most, civilian, low impact, injuries is not clear. The authors here show again, that good outcomes can be obtained with a conservative, select approach.

I applaud these authors from northern India and their dedication to assessment of their system and treatment methodology with respect to vascular injury in a near combat type of environment. The ultimate outcomes described are worthy and the context of the challenges surrounding vascular injury measured. These assessments are vital and instructive. Clearly, as a surgical community there is much to appreciate here as well as knowledge gap identification. If we are ever to improve early and long-term outcomes from traumatic vascular injury, we should pursue these gaps diligently. It will benefit our patients, our troops and our world colleagues.

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