

### **The Modern Management of Splenic Injury: A model for coordinated trauma services**

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The modern management of trauma is continually evolving; based on the foundations of Advance Trauma Life Support (ATLS),<sup>1</sup> advances in technology for radiological diagnosis and intervention have revolutionized the hospital care of the trauma victim. The growing trauma burden from both Road Traffic Collisions (RTCs) and interpersonal violence and existing deficits in trauma care provision in Pakistan were recently highlighted in this journal,<sup>2</sup> as was the absence of pre-hospital care provision and dearth of hospital ATLS providers.<sup>3</sup> In developing a robust system of trauma care from its foundations, Pakistan must look to the practice of experienced centres and 'borrow' best practice within the limits of local care facilities. The changes in management of abdominal solid organ injury serves as a paradigm for coordinated trauma care, with a shift away from mandatory laparotomy towards policies of 'Selective Non-operative Management' (SNOM) and splenic conservation. These changes have been spearheaded by the high volume trauma centres in the United States and South Africa and are typified by the current multimodality management of splenic injury.

The spleen is particularly vulnerable to injury by virtue of its position under the left lower ribs, its fragile capsule and multiple tethering ligamentous insertions. Blunt mechanisms predominate: decelerative forces cause avulsion injury at points of ligamentous or vascular insertion; direct compression ruptures the delicate capsule and secondary penetrating injury from overlying fractured ribs additionally contribute. RTCs are the commonest cause both worldwide<sup>4</sup> and in Pakistan; 58% of the splenic injuries reported by Mufti et al<sup>5</sup> were from blunt injury, a rate similar to that reported by Gangat,<sup>6</sup> where one third of splenic injuries were from RTCs. The question remains however: why should Pakistan strive for a co-ordinated system of trauma care that salvages injured spleens? The spleen is no longer viewed as a 'disposable' organ that Kocher suggested could be removed 'with no evil effects',<sup>7</sup> but an integral part of the reticulo-endothelial system important in combating infection by encapsulated organisms such as *Streptococcus pneumoniae*, *Haemophilus influenzae* and *Neisseria meningitidis* and protozoal agents including the malaria parasite. Asplenia confers vulnerability to these infections and may culminate in

'Overwhelming post splenectomy sepsis' (OPSS), particularly in children. The incidence of OPSS is not especially high but has a mortality rate of 50%.<sup>8</sup> Malaria remains endemic in Pakistan and splenectomy increases susceptibility to more severe malarial infection in previously immune individuals.<sup>9</sup> Post splenectomy prophylaxis such as immunization against the encapsulated bacteria and maintenance anti-bacterials - are a life-long burden unlikely to be available to, or tolerated by, the majority of the population of Pakistan.

Awareness of the immunological function of the spleen has led to the development of a range of operative techniques for splenic salvage including simple packing or suture repair, the use of tissue adhesives and mesh wrapping to bolster the injured organ and promote haemostasis,<sup>10</sup> particularly in the paediatric population. The natural extension of operative splenic salvage is to salvage spleens without recourse to laparotomy. One quarter of all trauma laparotomies are non-therapeutic and expose the patients to the substantial risks of short-term complications of negative laparotomy,<sup>11</sup> as well as the financial cost to the health care system of this approach. Selective Non-Operative Management (SNOM) is the logical extension of operative splenic salvage and is now well established in most sizeable trauma centres.

During abdominal assessment frank peritonitis or an intra-abdominal cause of haemodynamic instability mandates immediate laparotomy; if this is not the case then non-operative management should be considered. SNOM of abdominal trauma has standard inclusion criteria which demand the patient to be haemodynamically stable after resuscitation with minimal transfusion requirement, available for meaningful regular reassessment which excludes those patients who require surgery for other injuries or have head or spinal cord injury. Observation should be in a high dependency environment with suitable critical care input. The other requisite is a solid organ injury of suitable grade for non-operative management. This relies on the ready availability of CT scanning and experienced radiology support to accurately grade these injuries. Modern helical scanners produce high quality images in a single breath-hold and may disclose unsuspected injuries. The negative predictive power of CT in predicting the need for

surgery in abdominal injury is in excess of 99%.<sup>12</sup> However, it is less accurate in some injuries — particularly those to the small intestine and diaphragm — instead relying upon a constellation of circumstantial findings.<sup>13</sup> Grading systems for solid organ injuries based on their CT appearances of haematoma, parenchymal and vascular injury<sup>14</sup> allow prediction of likely success of non-operative management. CT imaging may be complimented by angiography for diagnosis of vascular injury and angio-embolisation can be used to limit haemorrhage.<sup>15</sup> Application of the conservative approach to penetrating injury is more limited, due to a much higher proportion of associated hollow viscus and diaphragmatic injuries.

Non-operative management of blunt splenic trauma works.<sup>4</sup> Over half (54.8%) of 1488 adult patients with blunt splenic injuries were managed conservatively with a failure rate of 11%, most of which occurred within 24 hours. Increasing grade of splenic injury mitigated against SNOM — 24% of Grade I and 95% of Grade V injuries proceeded to immediate laparotomy. The mortality rates from these three approaches — operative, failed SNOM and successful SNOM — were 25.9%, 16.5% and 4.5% respectively.

Can these multimodality approaches be implemented in the Pakistan health system? Mufti et al<sup>5</sup> salvaged 5 out of 19 injured spleens across injury Grades I-IV; Gangat et al<sup>6</sup> reported a 9% splenic salvage rate and a further series an 8.3% salvage rate.<sup>16</sup>

It would be naïve to believe that such a system could be delivered as a pre-formed package to healthcare services in Pakistan. It requires an enormous infrastructure, with multiple co-operative elements as outlined here. Healthcare providers are faced with the dual burden of rising trauma and a healthcare system lacking coherence of delivery of pre-hospital and early trauma care. Trauma services must be founded upon consistent delivery of basic care. The ABC approach remains a fundamental prerequisite. However, where financial considerations allow, clinicians must be provided with the infrastructure to

deliver optimal care. Techniques must be in keeping with global experience and modeled upon high-volume experienced centres. Awareness of contemporary management is then vital at the planning stage in the development of trauma services in Pakistan.

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