The History of Colonic Surgery in War

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SUMMARY: The history of laparotomy for penetrating abdominal wounds is reviewed from its origins in the sixteenth century to the large series from World War II. It is shown that the mass casualties of World War I allowed the management of organ specific injuries to be studied. This review concentrates upon one of the most contentious topics in war surgery - the management of colonic wounds, and suggests that post-war surgical practice may have been influenced too strongly by experiences from the pre-Penicillin era.

The Early Years

Despite man's propensity for conflict, and the frequency of war through the ages, the surgical treatment of war wounds of the abdomen has a relatively short history. Occasional mention is made of surgical repair of war wounded bowel, with the first probably being reported by Hieronymus Brunschwig, in 1525 (1). The majority of surgeons operating before 1850 were reluctant to perform laparotomy in cases of penetrating abdominal trauma. Ambroise Paré, the sixteenth century French surgeon and father of military surgery, did not undertake more than replacement of eviscerated bowel (without attempt to suture), and Napoleon's surgeon, Jean Dominique Larrey reported only a single case of successful enterorrhaphy (2). In peace and war the only survivors of colonic perforation developed faecal fistulae through their wounds. This point was noted by the Littre, who was given credit for performing the first elective colostomy in 1710 (although this was in a child with imperforate anus) (3).

Despite the development of techniques such as colostomy, formal laparotomy with enteric surgery was still uncommon in the early 1800s. Baudens, another pioneer of colostomy, reported what are probably the earliest laparotomies for abdominal gunshot wounds. In 1830 he recorded two cases from the French-Algerian War in which he performed formal laparotomy and enteric repair; one patient survived (4). His experience in dealing with soldiers injured in the Crimean War (1854-56) led Baudens to recommend the introduction of a finger through an enlarged wound to identify faeces, blood or gas in the peritoneal cavity - his indications for laparotomy.

The experience and advice of Baudens was not heeded when, less than a decade later in the American Civil War (1860-65), neither the Union nor Confederate medical services advocated intervention in abdominal trauma. Otis recognised that whilst some soldiers survived abdominal gunshot wounds, the majority died of peritonitis. He concluded "*It appears that laparotomy will henceforth be employed with increasing frequency ... in wounds of the abdominal organs*" (5).

Ironically Sims, who fled his native America during the civil war to work in Europe, was the first strong advocate of laparotomy for abdominal gunshot wounds. Sims' experience was largely gained whilst serving as commander of the Anglo-American Ambulance during the Franco-Prussian War (1870-71). He recognised that penetrating abdominal injuries invariably resulted in death due to septicaemia, and by applying modern surgical techniques, namely adequate exposure through a large wound and evacuation of "*blood and other poisonous effusions*" recovery was likely (4).

It was from Sims' advice that Colonel Stevenson, the Professor of Military Surgery of the RAMC, formulated a policy of laparotomy for penetrating abdominal wounds with evidence of visceral damage. This policy was adhered to in the

Boer War (1899-1902) in which Sir William MacCormac was the senior consulting surgeon. The total death rate for 20 abdominal wounds in the war was 30% (6), but these data exclude those who died immediately on the battlefield, and would have included a number of injuries to the abdomen which did not penetrate the peritoneum. Of the 26 laparotomies reported, there were 8 survivors (7). This was a great improvement in outcome compared to the almost universally fatal result of untreated injuries seen in previous conflicts, but when compared to the overall data for the war (inaccurate as they were), the results were not as encouraging as Stevenson and MacCormac would have wished. In despair at seeing the majority of his patients die, MacCormac wrote: "*a man wounded in the abdomen dies if he is operated on and remains alive if he is left in peace*" (8). This comment, known as 'MacCormac's Aphorism' was to cloud military surgical opinion into World War I.

World War I

At the outbreak of WWI, surgical intervention in cases of abdominal penetrating injury was accepted by the majority of civilian surgeons but not by their military counterparts. The mortality rates as a result of this non-operative strategy were high (greater than 80%). It was not until 1915 that the value of laparotomy in these casualties was established. Professor Owen Richards, temporarily working with the British Expeditionary Force, recommended laparotomy with resection of small bowel injuries (to reduce the risk of stenosis and obstruction) and suture repair of duodenal and colonic wounds (9). He remarked that it was imperative to prevent leakage of intestinal contents to reduce the risk of peritonitis. However, during the first year of the war, battle lines were too unsettled to allow adequate surgical facilities to be located close enough to the wounded to be of use. During August 1915, with opposing armies fighting along static lines of trenches, surgical policy changed to one of intervention in all but selected cases (10). The number of operations performed following this change in policy was considerable. Sir Cuthbert Wallace, the senior British surgeon, reported that 3250 abdominal operations were performed by allied surgeons between July 1915 and September 1917 (7) and in a review of gunshot wounds of the abdomen he noted that the colon was injured in 26% of 965 cases (11). This analysis allowed colonic injury to be compared with wounds of other organs, and the review of organ specific injury became established. Wallace estimated a mortality of 60% for all cases of abdominal gunshot wound, and 59% for cases in which the colon was the only organ injured. It is noteworthy that prior to 1915 the mortality for similar colonic wounds was 66% and that the major area in which there was an improvement in outcome with surgery was small bowel repair, in which mortality fell from 86% before 1915 to 39% with enterorrhaphy (11).

In 1917, two RAMC surgeons, Fraser and Drummond reported a series of 85 patients with colonic injury (12), categorising the surgical options available as simple suture, suture with a proximal colostomy, and colostomy at the site of injury. Early in their series they were suspicious of the healing of the colonic suture-line and so protected the colonic repair with a proximal colostomy. They later suggested that colostomy was rarely necessary and claimed to have almost abandoned its use. They also claimed an improvement in results (presumably mortality) by the placement of an omental graft over sutured colonic wounds. Colostomy at the site of injury was performed for severe wounds unsuitable for simple repair; resection and primary anastomosis was not advised. This treatment protocol, and the introduction of early intravenous fluid resuscitation, resulted in mortality rates of 41-42% for colonic surgery in WW1 (7).

World War II

Surgical opinion in the early years of the war was firmly in favour of primary colonic repair for small wounds, with resection and anastomosis for more complicated injuries (13,14). This was to change with the publication of perhaps the most significant series of colonic injuries in war (15). Ogilvie's analysis of battle casualties from the North African campaign (August to November 1942) and his enthusiasm for colonic exteriorisation form the basis of current British Military surgical policy (16). In this series, Ogilvie reported a mortality rate of 40% for isolated colonic injury, however this referred to a total of only 20 patients, of whom 8 died. The total number of colonic injuries reported were 107, with a mortality of 50%, and the mortality rate for uncomplicated colonic injury (without extra-abdominal injury) was 51%. Ogilvie suggested that "exteriorisation of colonic injuries, is, perhaps the greatest single factor in the improved results we are able to record". Interestingly, Ogilvie recorded that of the 26 patients who had definitive primary colonic repair, the mortality rate was 46%.

Soon after Ogilvie's series was reported, a US military surgeon reported a series of abdominal wounds from the first year (1943-44) of the Italian Campaign (17). Imes argued against mandatory colostomy, reporting "primary suture of perforations in 25 cases was done without difficulty" in the 83 cases of penetrating colonic injury treated, and that overall mortality for colonic injuries was 29%. The value of blood transfusion was stressed once more, but Imes recorded that antibiotic "chemotherapy has played a significant role in the low incidence of peritoneal infection" and mortality in his series. Imes reported using Sulphonamides, which were used by surgeons in Ogilvie's series, and Penicillin, which was not yet available. Ogilvie's series, and the conclusions drawn from it were already out of date by the end of the war. Moreover, Ogilvie agreed that colonic repair was permissible under certain circumstances where "under the influence of these antiseptics ... the policy (of mandatory colostomy) was somewhat modified in that closure of small perforates in the proximal colon was countenanced" (18). Based upon such findings, in 1945 the AMD published a bulletin intended as an appendix to the Field Surgical Pocket Book 1943, but its contents were not widely publicised, and have not been incorporated into subsequent editions (19). Relating to

injuries of the large intestine, the bulletin stated "many experienced surgeons are moving away from the principle that a damaged colon must always be exteriorised. They feel that in the right half of the colon small perforations with clean-cut margins and no surrounding bruising can be safely dealt with by careful suture".

In more than half a century since the end of World War II, civilian surgeons have all but abandoned the use of colostomy in abdominal trauma, and primary colonic repair is gaining increasing acceptance amongst military surgeons. It appears that Ogilvie's legacy will be carried into the new millennium, but a policy of primary colonic repair and selective use of stomas will soon be adopted by many surgeons in war.

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