Gastrointestinal and renal complications in burned patients

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Summary. During an 11 year period of burn treatment, from 1 January 1979 until 31 December 1989, a total of 915 burn injury patients were admitted to our center. All patients were treated with the Parkland formula. During the treatment of these burn patients, 24 (2.6%) encountered gastrointestinal complications (GI), with 22 of them having upper GI complications. Vagotomy + pyloroplasty or vagotomy + gastrojejunostomy, along with oversewing, was performed in four patients with massive bleeding, terminating the bleeding. Eighteen of the 22 patients with upper GI bleeding died. Four of these deaths were due to massive bleeding, and the remaining were due to septic complications. Nineteen (2%) of the 915 burn patients admitted to our center during this time were major burn patients, requiring dialysis treatment due to acute renal failure. The burn injuries in these patients varied statistically (P = 0.01). Reasons for acute tubular necrosis (ATN) in the renal failure patients was either multiple organ failure (MOF) or sepsis. The mortality rate in patients requiring dialysis was 78.9% in acute renal failure patients; 100% in flame burned patients and 60% in electrically burned patients.

Key words: Burn injury – Treatment – Gastrointestinal and renal complications – Mortality

Despite the recent variety of sophisticated treatment existing in the field of burn injury, gastrointestinal and renal complications are among the major problems found in burn patients. Gastrointestinal changes following thermal injury are common and are manifested by early coffee ground gastric material in most major burn cases. The photogenesis of this lesion has not yet been clarified, nor have all of the functional alterations been well delineated [1, 2]. The renal response towards thermal injury is difficult to interpret, yet it is quite clear that acute renal failure rarely occurs if prompt and adequate resuscitation is accomplished [1, 3].

Material and method

During an 11 year period of burn treatment, from 1 January 1979 until 31 December 1989, a total of 915 patients with various types of burn injuries were admitted to our center. All patients were treated with the Parkland Formula; namely, Ringer's Lactate solution, of which 2–3 ml/kg/percentage of burn area, was administered during the first 24 hours. The amount of fluid given was calculated in relation to the time of the patient's admission to the hospital.

During monitoring of the urine output, 0.5–1.0 ml/kg of body weight/h, represented an adequate output, and these patients were followed closely during the first 24 h in case of occurrence of early complications. For patients who were oliguric and acidotic, sodium bicarbonate, 20–40 g of mannitol, and 4–100 mg of furosemide were administered. If the patient still remained oliguric and acidic with rising potassium and BUN and creatinine levels, he then underwent peritoneal dialysis or hemodialysis, through the use of a double lumen subclavian catheter (Gambro SCK-102 20 cm Lund, Sweden). This system is considered to be an easy method for hemodialysis and parenteral alimentation. A urinary catheter and central venous catheter were used only for severe cases, or if clinically indicated. Following initial stabilization, the patients were taken to the dressing room for reevaluation and when necessary, debridement, escharotomy and fasciectomy were performed. After premedication, the wounds were then closed using one of the local chemotherapeutic agents, such as silver sulfadiazine, mafenide acetate, or silver-incorporated amniotic membrane (SIAM) [6]. In some cases, antacids and/or H2 receptor antagonist were administered for prevention of upper gastrointestinal (GI) bleeding. In cases in which GI bleeding did develop, nasogastric irrigation, antacids and/or H2 receptor antagonist blood replacement, and sedative drugs were administered. If upper GI bleeding could not be aborted with medical treatment, then surgery was required.

Results

During the treatment of the 915 hospitalized burned patients, the following GI complications in 24 (2.6%) pa-
patients were encountered: One 10-month-old female patient with a hot water burn injury had a duodenal perforation; one 36-year-old male patient had a massive small bowel necrosis, due to an electrical injury; and 22 other patients had upper GI bleeding.

The causes and average burn areas in the upper GI bleeding patients were: 22 patients with flame injuries, with 14 of these having an average total burn surface area (TBSA) of 44.7%; hot milk and hot meal injury in four patients with the average TBSA being 35.7%; and chemical burn injury in one patient with the TBSA being 74%. Eighteen of the 22 patients with upper GI bleeding died, with the mortality rate being 81.8%. Four of these deaths were due to massive bleeding, and the remaining to septic complications. Four patients were operated upon in order to control the upper GI bleeding. Vagotomy and pyloroplasty was performed in three patients and vagotomy and gastrojejunostomy in one patient. Oversewing of the bleeding site was also performed in these four patients, resulting in termination of the bleeding.

The bleeding episode lasted for an average of 10.1 (range 1–14) post-burn days. Sepsis was revealed in seven patients upon post-burn days 11–15. It is well worth mentioning that throughout the term of bleeding, 16 out of the 22 patients had been on oral diets and seven had been on antacids and/or H₂ receptor antagonists.

During the same period, 19 (2%) of the 915 burn patients admitted to our center were major burn patients, of which 17 were male and two were female, with an average age of 30.9 years, requiring dialysis treatment due to acute renal failure. The causes for these burns were flame in nine; electrical in nine; and lightning in one patient (Fig. 1). The average TBSA was 67.6% in flame casualties; and 23.2% in electrical casualties, which also included the one lightning strike.

The burn injuries in those patients requiring dialysis treatment varied statistically (p < 0.01). One of the 19 patients underwent hemodialysis; 13 underwent peritoneal dialysis; and five underwent both. Dialysis treatment was started on the first three (mean 1.8) days in 14 patients. The remaining three patients underwent dialysis on post-burn days 7–13 (mean 9.6).

The reason for renal tubular necrosis (ATN) in the first group of renal failure patients was multiple organ failure (MOR) and sepsis in the second group.

The mortality rate in patients, who received dialysis for acute renal failure was 78.9% (15 out of 19 patients died). The mortality rate in flamed burned patients requiring dialysis was 100% (all nine patients died); and in the electrical burned patients requiring dialysis, the mortality rate was 60% (six out of ten patients died) (p < 0.05) (Fig. 2). On average, death occurred on the 8th burn day (range 2–20) due to sepsis. Upon the onset of renal failure, death occurred 4.5 days later in ATN (acute tubular necrosis) patients and 2.5 days later in MOF patients.

Discussion

Severe complications in burned patients such as sepsis, acute renal failure, gastrointestinal bleeding, myocardial infarction, small bowel necrosis, pulmonary embolus, duodenal perforation and adult respiratory distress syndrome (ARDS) can occur [1–3, 5, 7, 8]. Acute renal failure, requiring dialysis, and gastrointestinal complications such as upper GI bleeding, duodenal perforation and massive necrosis of the small intestine, was encountered in 2.6% and 2.0% respectively.

The mortality rate was high in acute renal failure and gastrointestinal complications [3, 8]. Eighteen out of the 22 patients with upper GI bleeding died; a mortality rate of 81.8%. The prevention of upper GI bleeding is an important factor. For patients with severe burn injuries, sepsis should be controlled and H₂ receptor blockers and/or antacids administered [1, 8].

Acute renal failure is another important complication in severely burned patients, varying in incidence from 1.5% to 18% [1, 3, 4]. Quite a few factors, including those discovered by our team, have been responsible for renal complications. In our series, acute renal failure requiring dialysis was attributed to the lack of early fluid resuscitation. Upon diagnosis of acute renal failure, peritoneal or hemodialysis must be instituted if the patient is to survive. Recently, our primary preference has been hemodialysis, due to its minimal discomfort for the patient and ease of management by the medical staff.

Despite all of the previously mentioned treatments, the mortality rate in this group was high (78.9%), with