The Abdominal Compartment Syndrome: Enteric Feeding May Prolong Closure

C Perry, B Phillips

Citation

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Abstract

Patients with an open abdomen who receive post-operative enteric nutritional support may have a delay in subsequent abdominal wall closure. To address this possibility, a retrospective study of twenty-four consecutive trauma patients was conducted. Subsequent analysis revealed that post-operative enteric feeding in patients undergoing temporary abdominal wall closure delayed definitive treatment yet did not seem to affect overall survival.

INTRODUCTION

Surgeons have utilized temporary abdominal wall closure following trauma laparotomy since World War II.[1] Recently, the definition of (and clinical importance of) abdominal compartment syndrome (ACS) has been refined and indications for peritoneal decompression have been standardized.[2] One of the most popular ways to accomplish this decompression is by using a gas-sterilized 3 liter intravenous bag.[3] While abbreviated laparotomies and temporary abdominal wall closures have allowed surgeons to care for severely injured patients, it has also created new challenges in patient care. The purpose of this study was to examine the effect of enteric feeding on the timing of permanent closure in the management of ACS.

METHODS

The management and outcome events of all consecutive trauma patients treated with an "open abdomen" during a 12 month period were reviewed. Abdominal cavities were either left primarily "open" following an abbreviated celiotomy or secondarily opened for signs of intra-abdominal hypertension. Temporary abdominal closure was achieved using a Bogotá bag in each of the respective patients, regardless of the primary or secondary nature. [4,5] A retrospective chart review was conducted to collect data concerning patient demographics, diagnosis, perioperative events, type of final closure, length of stay, complications, and operative mortality (OM); use of enteric feeding while the temporary closure was in place was also carefully noted as well as the role of total parenteral nutrition.

RESULTS

Twenty-four patients (18 males; 6 females) were found to have undergone a temporary abdominal wall closure within the 12 month review period. The average age for the entire group was 42 years (range 5-85). The most common diagnosis resulting in the need for an "open abdomen" was intra-abdominal trauma (16 cases), followed by intra-abdominal sepsis (8 cases). The average number of re-operative procedures was 2 (range 0-6). Six (25%) primary closures were performed at an average of 5 days following placement of the temporary device (range 2–12 days). In 13 cases (75%), the abdomen was closed with absorbable mesh at an average of 10 post-operative days (range 3-14 days). Of these 13 patients, 11 went on to require skin grafting (placed at an average of 46 days; range 20-150 days). The average length of stay in the hospital for the entire group was 37 days (range 1 to 180 days); the average length of stay in the intensive care unit for the entire group was 19 days (range 1 to 90 days).

Of the 24 patients, 7 (70%) developed pneumonia (defined as a radiographic infiltrate and positive sputum cultures), 8 (33%) required further operative treatment for their intra-abdominal infections, and 7 died within thirty days (OM=30%). There were 10 (41%) wound infections and one (4%) ileo-cutaneous fistula. Of the 17 survivors, 11 (65%) patients developed a ventral hernia requiring further repair via placement of a permanent mesh at a much later date (at an average of 14 months from their initial insult).

Of the 24 patients, 9 (37%) were started on enteral feeding

while their abdomens were temporarily closed. The remaining 15 (63%) patients were supported with total parenteral nutrition. Of the 9 enteric-fed patients, 3 (33%) were closed primarily at an average of 8 days (range 3–12 days). Of the 15 non-enteric patients, 3 (20%) were closed primarily at an average of 2 days (p=0.08). The enteric-fed patients also required, on average, an additional 2 days (compared to the non-enteric group) until definitive mesh closure could be completed (9.3 days; range 3 – 12 days vs. 11.3 days; range 9-14 days: p = 0.28) [Table 1].

Figure 1

Table 1: Timing of Final Closure

	(n)	Primary Closures [%]	Average Days *(range)*	Mesh Closures	Average Days *(range)*
Enteric	9	3/9 [30]	8 (3-12)	3/9 [30 %]	11 (3-12)
TPN	15	3/15 [20]	2 (2-4)	10/15 [66 %]	9 (3-12)

Complications in both groups were similar [Table 2]. There were 2 (22%) deaths in the enteric group versus 5 (33%) deaths in the non-enteric patients (p=0.xx). Thirty-three percent of both subgroups (enteric:3/9 patients; non-enteric:5/15 patients) developed secondary intra-abdominal infections requiring further operative intervention.

Figure 2

Table 2: Differences in Patient Outcome

Outcome Events	Enteric	Non-enteric
OM	2 (22%)	5 (33%)
Intra-abdominal Infections	3 (33%)	5 (33%)
Ventral Hernia	5 (55%)	9 (60%)
ICU days	19	17
Operations	2.33	2.73
Pneumonia	7 (77%)	10 (66%)
Wound Infections	5 (55%)	5 (33%)

CONCLUSION

The “abdominal compartment syndrome” refers to an increased pressure within the coelomic cavity that ultimately compromises renal, pulmonary, gastrointestinal, and/or cardiovascular function.[6] Decompressing the abdomen effectively relieves the pressure yet creates a substantial abdominal wall defect. Once intra-abdominal hypertension has been diagnosed, the cavity should be decompressed; one effective method of decompression is via the use of a “Bogota” bag - a gas sterilized 3-liter polyvinyl chloride intravenous bag that is specifically fitted to the wall defect. The bag is attached to the abdominal wall with #2 permanent monofilament sutures.[7] The properties that make this technique appealing include cost, availability, inertness, and strength. A “Bogotá” bag provides non-desiccating coverage of the viscera and can prevent erosion into the bowel. However, limitations of this approach include tearing at the suture line and difficult access to the visceral contents once applied. Other authors have utilized Gor-Tex patches (W.L. Gore and Associates, Inc., Flagstaff, Arizona) for temporary abdominal wall closure with good results.[8] This temporary closure is then covered with wide mesh gauze, two small suction drains and a catheter allowing 10-20cc an hour of normal saline to be applied to the surface in an attempt to prevent desiccation. [Figure 1] Ostomy wafers are placed laterally and a clear plastic dressing is placed over the gauze, drains, and IV bag creating a “Bogotá bag” dressing which will provide a non-desiccating negative pressure healing environment.

Figure 3

Figure 1: Temporary Abdominal Wall Closure

Fascial closure is typically possible in up to seventy percent of patients within three days of temporary decompression.[9] In our review of “open abdomens”, the average time to primary closure was five days: 2 days in those with total parenteral nutrition and 8 days in those nourished with enteric feedings. Definitive primary closure, at our institution, usually included fascial and skin edge debridement followed by placement of retention sutures, interrupted fascial sutures and full-thickness ‘en-mas' technique. If primary closure was not possible within the first week, absorbable mesh was subsequently placed to restore the integrity of the abdominal wall. Once prominent granulation tissue formed, skin grafts were placed; this occurred, on average, two weeks after the mesh had been placed. The timing of our skin graft placement is similar to other reported series and must occur prior to disruption of

the absorbable mesh which predictably begins at three to four weeks. [10,11] The most common complication of this type of secondary closure was the development of a ventral hernia (75%). The hernias were repaired with permanent mesh and primary subcutaneous closure approximately one year after the initial insult. Other options for closure include components separation,[12,13,14] tissue expansion,[15] and local musculocutaneous flaps.[16]

While the ultimate timing and method of abdominal wall closure is patient dependant, it appears that enteric nutritional support may delay both primary and secondary closure. However, the overall outcome between our two groups did not seem to differ in regards to infectious complications, length of stay in the intensive care unit, subsequent operative procedures, or overall operative mortality. The major weakness of our review is the small sample size. Prospective studies evaluating the proper role, and form, of early nutritional support in patients undergoing temporary abdominal closure would be beneficial.

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Author Information

Charles W. Perry, M.D.
Dept. of Surgery , University of Massachusetts

Bradley J. Phillips, M.D.
Critical Care Medicine, Boston Medical Center