

## Experience with Early Postoperative Feeding after Abdominal Aortic Surgery

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**Background:** Abdominal aortic surgery is a form of major vascular surgery, which traditionally involves long hospital stays and significant postoperative morbidity. Experiences with transit ileus are often encountered after the aortic surgery. Thus traditional postoperative care involves delayed oral feeding until the patients regain their normal bowel activities. This report examines the feasibility of early postoperative feeding after abdominal aortic aneurysm (AAA) open-repair.

**Methods:** From May 2002 through May 2003, 10 consecutive patients with infrarenal AAA who underwent elective surgical open-repair by the same surgeon in our department were reviewed. All of them had been operated upon and cared for according to the early feeding postoperative care protocol, which comprised of adjuvant epidural anesthesia, postoperative patient controlled analgesia, early postoperative feeding and early rehabilitation. The postoperative recovery and length of hospital stay were reviewed and analyzed.

**Results:** All patients were able to sip water within 1 day postoperatively without trouble (Average; 12.4 hours postoperatively). All but one patient was put on regular diet within 3 days postoperatively (Average; 2.2 days postoperatively). The average postoperative length of stay in hospital was 5.8 days. No patient died or had major morbidity.

**Conclusions:** Early postoperative feeding after open repair of abdominal aorta is safe and feasible. The postoperative recovery could be improved and the length of stay reduced by simply using adjuvant epidural anesthesia during surgery, postoperative epidural patient-controlled analgesia, early feeding, early ambulation, and early rehabilitation. The initial success of our postoperative recovery program of aortic repair was demonstrated.

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**Key words:** early feeding, abdominal aortic aneurysm, postoperative care.

Abdominal aortic aneurysm (AAA) resection is one of the major surgeries that vascular surgeons encounter in their daily practice. Although the endovascular repair of AAA had been advocated in

selected cases, with low morbidity and superior recovery, transperitoneal open repair remains the gold standard for yielding the best long-term results. However, transperitoneal open repair of AAA tradi-

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tionally involves long hospital stays and significant postoperative morbidity. Traditionally, patients who have undergone AAA open surgery suffer long and rather painful postoperative recovery periods. Postoperative ileus have been reported as one of the major complications after AAA repair.<sup>(1)</sup> Thus, patients are allowed enteral feeding only when the bowel sounds have returned to normal. Postoperative parenteral nutritional support is often needed and the length of the hospital stay is long. Lots of methods to minimize the surgical and anesthetic trauma during AAA surgery have been proposed to enhance the recovery of those patients after surgery.

Here we describe the routine use of the early postoperative feeding methods to improve the recovery and minimize possible morbidity following AAA open repair surgery. The feasibility and safety of early postoperative feeding combined with other adjuvant methods such as adjuvant epidural analgesia, postoperative epidural pain control, early extubation of endotracheal tube, early ambulation are examined. The goal of these combined methods is to shorten the hospital stay and allow the patient to return to ordinary daily activity as soon as possible.

## METHODS

From May 2002 through May 2003, 10 consecutive patients with infrarenal aortic aneurysm who underwent elective surgical open repair by the same surgeon were reviewed. All of the patients were operated upon and cared for according to the early postoperative feeding protocol, which will be described below.

### Operative technique

All patients were intubated and put under general anesthesia for the surgery. In each patient an epidural catheter was inserted into the second lumbar vertebral space preoperatively. Adjuvant epidural anesthesia using Marcaine, Xylocaine, and Fentanyl infusion via the epidural catheter during the procedure was administered in addition to the general anesthesia.

A standard midline full laparotomy was used to approach the aortic aneurysm. The bowels were wrapped with wet pads and retracted carefully to the right side of the abdomen cavity instead of exteriorization of the bowels outside the abdomen cavity.

The anterior aspect of the aortic aneurysm as well as the proximal aneurysm neck was identified and exposed. The inferior mesentery artery was usually transected and ligated. The patient then underwent heparinization with an intravenous injection of 5000 U Heparin. We cross-clamped the iliac arteries and the aneurysm neck sequentially, and then made a longitudinal incision into the aneurysm wall. A Dacron tube graft or bifurcated graft was then sutured to the proximal neck and the distal neck (or iliac arteries) in the standard fashion, to exclude the aneurysm sac after complete ligation of the back bleeding of the lumbar arteries. The aneurysm sac was trimmed and wrapped around the graft. The abdominal wall was then closed in layers. No protamine was used to reverse the heparinization.

### Postoperative care

All the patients were sent to the intensive care unit for further care postoperatively.

No postoperative parenteral nutritional support involving amino acid and fatty acid infusion was provided routinely. The endotracheal tube was usually extubated after the weaning profile was found to be satisfactory and the patient was fully awake.

Instead of restriction of postoperative oral feeding until the bowel sound returned, the patient was allowed to sip water and have liquid diet immediately after extubation. The nasogastric tube was then removed. Routine metoclopramide intravenous injection every 6 hours was used to assist the movement of the bowels. Each patient was allowed a regular diet as soon as possible after the operation if no vomiting or sensation of nausea occurred. Most patients were transferred to the ordinary ward when the hemodynamic condition was stable and intensive monitor of vital signs was not needed. Patient-controlled analgesia (PCA), including marcaine plus fentanyl or plain ropivacaine, was routinely administered via the epidural catheter to minimize the pain of the laparotomy for at least 3 days. The patients were encouraged to get out of bed and begin to ambulate as possible.

### Discharge planning

Education on discharge planning was begun on postoperative day 1 when no major operative complications were evident. The criteria for discharge were as follows.

1. The patient was afebrile and hemodynamically stable.
2. The patient was free of any intravenous medication or nutritional support.
3. The patient could ambulate independently or at least regained his or her preoperative capacity to ambulate.
4. The patient could tolerate a regular diet and had normal stool passage.
5. The physician, patient, and patient's family (or the home caregiver) reached agreement on discharge.

## RESULTS

Our patient population included seven men and three women. The average age of those patients was 73.2 years old (63 to 89 years old). All of the patients except for two had history of hypertension. Two of the patients had history of diabetes mellitus. Six of the patients' aneurysms involved only abdominal aorta and other four of the patients' aneurysms involved either one or both of the iliac arteries. The average diameter of the aneurysm was 6.8 cm (5.5 cm to 9 cm). Four of the patients were implanted with Y shape Dacron vascular grafts for the reconstruction. The other six patients were implanted with tube shape grafts. All of the patients were operated upon successfully without any postoperative deaths or major morbidity such as bleeding, infection or visceral ischemia.

Table 1 presents the data regarding the postoperative recovery. All patients could sip water without problems immediately after extubation. In addition,

all but one of the patients were able to be put on a regular diet before the third day postoperatively. Most of the patients could ambulate on the floor with or without assistance before the third day postoperatively. The average intensive care unit stay was 18.8 hours and the average length of postoperative hospital stay was 5.8 days. No major or minor complications related to the early postoperative feeding were noted. No readmission was noted within 1 month after the operations for any of the patients.

## DISCUSSION

Surgical repair of abdominal aortic aneurysm has been considered one of the major operations in the field of vascular surgery for a long time. Although the graft materials, operative techniques, and anesthesia management have been refined during recent years, hospital-related costs and lengths of stay (LOS) following the open repair of AAA are still considered major disadvantages. The average hospital stay following AAA repair using the traditional open technique, as documented in the English literature in recent years, ranged from 8 to 34 days.<sup>(2-17)</sup> Traditionally, patients who underwent AAA surgical repair needed 2 to 3 days in an intensive care unit (ICU) for close observation before they could be transferred to an ordinary ward. Paralytic ileus is assumed to develop after the operation, so a parenteral nutrition supplement is often given before the patient resumes his normal oral food intake. Oral intake is not permitted before the bowel sounds return to their normal levels. Thus the traditional postoperative care for patients undergoing AAA

**Table 1.** Postoperative Recovery of Our Patients

Patient No.	Graft implanted	Sipped water (hours after operation)	Started regular diet (days after operation)	ICU stay (hours)	Started ambulation (days after operation)	Postoperative Length of hospital stay (days)
1	Y graft	24	2	24	3	7
2	+	6	2	15	2	7
3	Tube graft	6	1	17	3	7
4	Tube graft	7	3	16	5	6
5	Tube graft	24	5	24	3	7
6	Tube graft	24	3	31	4	8
7	Y graft	7	2	17	2	3
8	Y graft	8	2	16	2	4
9	Tube graft	6	1	14	2	4
10	Y graft	12	1	14	2	5
Average		12.4	2.2	18.8	2.8	5.8

open repairs involves relatively long hospital stays, especially in contrast to those required following endovascular repairs which allow for much earlier postoperative feeding.

Many improvements and modifications of the surgical treatment of AAA surgical repair have been developed, including the minilaparotomy technique, the laparoscopic assisted technique, and the endovascular technique to minimize the invasiveness and ensure the quality of AAA repair. Several modifications to the postoperative care of AAA repair patients have been proposed to decrease the postoperative morbidity, minimize the hospital stay and cost, and facilitate postoperative recovery. In our series, methods such as epidural catheter insertion for anesthesia and postoperative pain control, as well as early ambulation were used to enhance early feeding during the postoperative period and facilitate the recovery of our patients.

The surgical repair of AAA has been conducted under general anesthesia for a long time. However, general anesthesia agents may profoundly affect the respiratory system, cardiac system, and gastrointestinal system and impair the postoperative recovery. Epidural anesthesia, whether alone or combined with general anesthesia, has been reported to reduce the length of hospital stay and the stay in an intensive care unit following open or endovascular abdominal aortic surgery.<sup>(18-20)</sup> Some authors have advocated the exclusive use of epidural anesthesia for infrarenal aortic surgery to decrease the physiological disturbances associated with general anesthesia.<sup>(21,22)</sup> Some researchers have used epidural anesthesia with general anesthesia to reduce the general anesthetic and the systemic narcotic requirements during surgery, and thus perhaps facilitate early extubation and early feeding after the operation.<sup>(23)</sup> The use of a combination of epidural and general anesthesia has also been associated with more stable intraoperative hemodynamics and significantly lower postoperative pulmonary morbidity than the use of general anesthesia alone.<sup>(24,25)</sup> Thus we adopted adjuvant epidural anesthesia to facilitate early extubation after surgery and shorten the stay in the ICU.

Aggressive ambulation after major surgery has been proposed as one of the important mechanism for reducing hospital stay.<sup>(26)</sup> Early and aggressive ambulation may prevent pulmonary atelectasis and positively affect recovery. Early ambulation may

also promote gastrointestinal tract motility and help to resolve postoperative ileus.<sup>(27)</sup> Thus, early feeding can be given without difficulty. Patients in this series were encouraged to stand on the floor and begin to ambulate on the morning after surgery. In our initial experience, all of the patients could ambulate independently or had regained their preoperative ability for ambulating before they were discharged.

Laparotomy brings profound wound pain postoperatively and may prevent early postoperative ambulation and feeding. Postoperative pain control during various surgical procedures has been suggested to facilitate postoperative recovery and reduce operative morbidity.<sup>(28,29)</sup> Epidural anesthesia for pain relief following major surgical procedures can facilitate early oral nutrition intake, improve recovery, and reduce morbidity.<sup>(30)</sup> In our series, PCA was routinely administered via the epidural catheter for 3 days to eliminate the pain associated with laparotomy wounds effectively and facilitate early ambulation after aortic surgery. According to the authors' experience, the analgesia that was administered through the lumbar epidural catheter and was controlled by the patient was rather effective for relieving the pain of the laparotomy wounds and no systemic complications were noted. After the pain of the wounds was relieved, aggressive ambulation and rehabilitative exercise could be performed without a problem.

The inability to tolerate feeding after aortic surgery is well known to prolong hospitalization. Motor activity of the intestines has been demonstrated to decline after aortic surgery.<sup>(31)</sup> However, we do not feel that this eliminates the possibility of early feeding after aortic surgery. On the contrary, in patients who have undergone major laparotomy surgery or trauma, early enteral feeding is safer and more effective than parenteral or nasogastric feeding.<sup>(32-36)</sup> Avrahami et al. successfully demonstrated that gastric emptying was normal 18 hours after AAA surgery, as assessed by the Paracetamol absorption test. Therefore some researchers have suggested that enteral nutrition may be commenced on the second postoperative day.<sup>(37)</sup> According to our early feeding principle, oral feeding was begun as soon as possible postoperatively. Intravenous metoclopramide was used and early ambulation encouraged to enhance gastrointestinal tract motility. Usually, the patient was permitted to have a clear liquid diet after extubation of endotracheal tube. On

the first morning postoperatively, the bowel sounds remained silent or hypoactive, a regular diet was always given if no vomiting occurred. The nasogastric tube was clamped and removed in almost all of our patients without difficulty. In cases of uncomplicated abdominal aneurysm resection, we think that early feeding is possible postoperatively and may facilitate recovery.

This study applied the traditional transperitoneal techniques using full laparotomy as the standard approach to the abdominal aorta. In addition, the postoperative recovery courses of patients were rather smooth. Our recovery program allowed the patients to begin their regular diet feeding and they regained their ability to ambulate early and free of complications. Most important of all, the average postoperative hospital stay in was short (average 5.8 days) compared with those reported in the literature.<sup>(4,5,38,39)</sup> This initial successful experience suggests that postoperative recovery can be improved and the stay following open abdominal aneurysm repair shortened, by simply applying early postoperative feeding, adjuvant epidural anesthesia during surgery, postoperative epidural patient-controlled analgesia, early ambulation, and early rehabilitation. We described the initial success of our early postoperative feeding recovery program after AAA repair. However, more patients must be studied to establish the feasibility of such a fast-track recovery program for patients who have undergone infrarenal AAA open repair.

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## 腹主動脈手術後照顧應用早期進食的經驗

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**背景：**主動脈手術是重大的血管手術之一，在傳統上常在手術後需要一段相當長的住院恢復過程。在主動脈手術之後常會有一時的腸不蠕動情形，造成病人的延後由口進食因而有住院日數過長的現象。本研究回顧了我們在主動脈瘤術後恢復的照顧上應用早期進食情形。

**方法：**自2002年5月至2003年5月，總共有連續十個腹主動脈瘤的病人接受了常規的開腹主動脈手術。術中皆使用了硬膜上麻醉的輔助。術後照顧皆給予術後早期進食，再加上術後硬膜上止痛給予以及早期的下床復健等原則來幫助恢復。我們分析了這些病人的術後恢復狀況。

**結果：**所有的病人皆能在術後一天內就使用清流飲食(平均為術後12.4小時)。幾乎所有的病人(9/10)能在術後3天內恢復一般的經口飲食(平均為術後2.2天)。平均的術後住院日數為5.8天。沒有病人死亡或有重大的併發症。

**結論：**主動脈開腹手術之後給予早期的進食是安全且可行的。在手術時使用輔助性的硬膜上麻醉，術後使用病人主控式止痛，再加上早期的下床活動及復健，可以使得術後給予早期進食成為可能。我們認為這樣的主動脈開腹手術後術後恢復照護原則是成功且有效的。

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**關鍵字：**主動脈瘤，早期進食，術後照顧。

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