

Immediate Total Parenteral Nutrition After Radical Cystectomy and Urinary Diversion

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ABSTRACT

Introduction: The purpose of this study is to determine if administration of total parenteral nutrition (TPN) immediately following radical cystectomy and urinary diversion provides significant recovery benefit when compared to patients who did not receive TPN.

Methods: Retrospective chart review was performed on patients who underwent open radical cystectomy and urinary diversion from February 2002 to June 2010. Patients were divided into 2 cohorts—those who received immediate postoperative TPN and those who did not. Preoperative demographics, length of hospital stay, time until tolerating a regular diet and early postoperative complications of the 2 groups were extracted and compared.

Results: One hundred seventy-four patients (104 receiving TPN, 70 without TPN) were available for analysis. No significant difference in preoperative characteristics, length of hospital stay, estimated blood loss, or time until tolerating a general diet between the 2 groups was noted. With regard to complications, the incidence of bacteremia was significantly higher in the TPN vs non-TPN cohort (9% vs 1%, $P < 0.05$).

Conclusion: Immediate administration of TPN following radical cystectomy and urinary diversion does not provide a significant postoperative benefit and may lead to an increased risk of bacteremia.

INTRODUCTION

Radical cystectomy with urinary diversion is the gold standard treatment modality for muscle-invasive urothelial carcinoma of the bladder. Gastrointestinal dysfunction commonly is seen after the procedure and remains the most prevalent cause of delayed enteral feeding and discharge.¹⁻⁴ Historically, total parenteral nutrition (TPN) has been used to provide an alternative means of caloric intake while awaiting return of bowel function.⁵ However, parenteral nutrition is costly and may lengthen recovery and increase surgical morbidity.⁶ Previously published studies have

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shown that TPN does not influence the overall mortality rate of surgical or critically ill patients⁷ and its use should be limited to patients with specific indications.^{8,9}

In the urologic literature, only 2 cohort trials in the last 25 years have specifically examined the use of TPN in patients undergoing cystectomy and urinary diversion.^{10,11} Neither study demonstrated any significant recovery benefit with its routine use. Despite these findings, the standard use of TPN is common in many centers in an attempt to aid convalescence.⁶ The purpose of this study was to determine if administration of TPN immediately following radical cystectomy and urinary diversion provided a significant recovery benefit when compared to patients who did not receive immediate TPN.

METHODS

Following institutional review board approval, we retrospectively examined the medical records of all patients who underwent open radical cystectomy with urinary diversion from February 2002 to June 2010. Patients with incomplete medical records, history of abdominal/pelvic radiotherapy or bowel disease were excluded. The extirpative portion of the procedure was performed by one of 2 fellowship-trained uro-oncologic surgeons (WAS, PL) while the urinary diversions were constructed by one of 2 fellowship-trained reconstructive urologic surgeons (MLG, RCO). The type of urinary diversion utilized (ileal conduit, Indiana pouch, or orthotopic ileal neobladder) was based on patient/surgeon preference and overall patient health. The decision to administer TPN was dictated by surgeon preference as 1 surgeon (WS) preferentially started immediate TPN on all patients following radical cystectomy. Standard formula TPN (Table 1) was administered on postoperative day 0 via a central venous catheter placed intraoperatively using aseptic technique by the anesthesiology service. Patients not receiving TPN did not routinely undergo central

venous catheter placement. Orogastric tube decompression was utilized intraoperatively for all patients. The orogastric tube was removed at the time of endotracheal extubation. Postoperatively, a nasogastric tube was placed to manage delayed return of bowel function on an as-needed basis. Central lines were flushed with saline or heparin every 8 hours and covered with a bio-occlusive dressing. Central venous catheters were changed every 6 to 7 days until removal. Patients were started on a clear liquid diet following passage of flatus. Promotility agents were not routinely used to facilitate return of bowel function. Tolerance of a clear liquid meal prompted advancement to a general diet. TPN was discontinued after a patient tolerated a general diet.

Preoperative characteristics including patient age, gender, exposure to neoadjuvant chemotherapy and American Society of Anesthesiologists (ASA) class were recorded. Neoadjuvant chemotherapy with gemcitabine/cisplatin or methotrexate/vinblastine/doxorubicin/cisplatin was given to select patients prior to 2008 and nearly all radical cystectomy patients since 2008. Additional information abstracted from the medical record included length of hospital stay, time until tolerating a general diet, type of urinary diversion, estimated intraoperative blood loss, and final surgical pathology. Postoperative complications occurring within 30 days of cystectomy related to TPN/central venous catheter use were documented including bacteremia, venous thromboembolic events, uncontrolled hyperglycemia, cardiac arrhythmias, wound infection, or the need for additional minimally invasive procedures or reoperation. Bacteremia was defined as postoperative fevers >100.5°F associated with 2 separate site, positive blood cultures. Uncontrolled hyperglycemia was defined as any glucose level >200 on 3 readings when receiving TPN. Wound infection, which included superficial and deep infections, required a positive wound culture and associated clinical signs of infection. Need for reoperation referred to any operative procedure within 30 days of cystectomy that resulted from a complication arising from the original surgery.

Patients were divided into 2 cohorts (immediate TPN vs no TPN) and analyzed. Student's *t* test or Fisher's exact test were used to determine statistical significance.

RESULTS

Inclusion criteria were met by 174 patients: 104 (60%) received TPN and 70 (40%) did not. Demographic and perioperative information for the 2 groups are listed in Tables 2 and 3. No significant statistical differences were noted between the 2 cohorts regarding preoperative characteristics, type of urinary diversion, intraoperative blood loss, final pathology, time to tolerating a regular diet, or mean hospital stay. When comparing the 2 cohorts, the type of urinary diversion did not influence time to return of bowel function.

Nasogastric tubes were placed postoperatively to manage

Table 1. Standard Total Parenteral Nutrition (TPN) Formula

Protein	1.5 g/kg/day
Dextrose	3.5 g/kg/day
Fat	0.75 g/kg/day
Total kcal	25 kcal/kg/day
Electrolytes	
70 mEq NaCl	
30 mMol KPhos	
10 mEq Mg sulfate	
10 mEq Ca gluconate	
MVI	10 mL/day
Trace Elements	1 mL/day

Abbreviations = MVI, multivitamin infusion; mEq, milliequivalent; mMol, millimole

Table 2. Preoperative Demographic Information

	TPN (n = 104)	No TPN (n = 70)	P value
Mean age (range)	65.1 (39-85)	64.4 (45-89)	NS
Gender (M:F)	78:26	54:16	NS
Receiving neoadjuvant chemotherapy (%)	38 (37%)	27 (39%)	NS
ASA class	2.7 (1-4)	2.9 (2-4)	NS

Abbreviations = TPN, total parenteral nutrition; ASA, American Society of Anesthesiologists; NS, not significant.

Table 3. Perioperative Characteristics

	TPN (n = 104)	No TPN (n = 70)	P value
Type of diversion			
Ileal conduit	57 (54%)	45 (64%)	NS
Neobladder	35 (34%)	18 (26%)	NS
Indiana pouch	12 (12%)	7 (10%)	NS
EBL in mL (range)	803 (200-2500)	752 (200-2400)	NS
Final pathology			
P0 ^a	8 (8%)	4 (6%)	NS
Ta – T2 ^b	58 (56%)	44 (63%)	NS
T3 – T4 ^b	37 (36%)	22 (31%)	NS
Sarcoma	1 (1%)	0 (0%)	NS
Mean days to general diet (range)	6.2 (2–25)	5.9 (2–18)	NS
Hospital stay in days (range)	9.1 (4–36)	8.6 (5–20)	NS

Abbreviations = TPN, total parenteral nutrition; EBL, estimated blood loss.

^aNo detectable disease

^bTumor stage based on American Joint Committee on Cancer (AJCC) standard

delayed return of bowel function in 11 (11%) TPN patients and 9 (13%) patients who did not receive immediate postoperative TPN. Early postoperative patient complications are recorded in Table 4. The 2 groups demonstrated no statistical difference in complication frequency with the exception of bacteremia. Bacteremia was seen in 9% of immediate TPN patients and 1%

Table 4. Early Postoperative Complications

Morbidity	TPN (n = 104)	No TPN (n = 70)	P value
Bacteremia (%)	9 (9%)	1 (1%)	<0.05
Thromboembolic events (%)	6 (6%)	5 (7%)	NS
Uncontrolled hyperglycemia (%)	2 (2%)	1 (1%)	NS
Arrhythmia (%)	4 (4%)	4 (6%)	NS
Wound infection (%)	8 (8%)	5 (7%)	NS
Reoperation (%)	8 (8%)	3 (4%)	NS

Abbreviation = TPN, total parenteral nutrition.

of the non-TPN group ($P < 0.05$). Blood cultures/catheter tips grew *S aureus* in 7 patients and *E coli* in 3 patients. Additional procedures or reoperation were required in 8 (8%) patients in the TPN group due to stomal necrosis, pelvic abscess, intraabdominal hematoma, enterocutaneous fistula, small bowel obstruction, empyema requiring chest tube insertion, or ureterointestinal anastomotic leak requiring nephrostomy tube diversion. Three (4%) patients required additional procedures or reoperation in the non-TPN group as a result of a prolonged small bowel obstruction, lymphocele or ureterointestinal anastomotic leak.

DISCUSSION

Postoperative gastrointestinal dysfunction following radical cystectomy and urinary diversion is the most prevalent cause of delayed enteral intake and prolonged hospitalization.¹⁻⁴ Inadequate caloric intake may perpetuate postoperative catabolic states and increase complications following gastrointestinal surgery.¹²⁻¹⁴ TPN is commonly used in many centers following abdominal surgeries despite previous reports that the benefit of perioperative TPN is limited to severely malnourished patients with gastrointestinal malignancy.^{6,15} We sought to determine if patients receiving immediate TPN following radical cystectomy and urinary diversion demonstrated a recovery benefit when compared to a cohort that did not receive immediate TPN.

Our findings showed no recovery benefit with the addition of immediate TPN following cystectomy and urinary diversion. Mean time to tolerating a regular diet and total hospital stay were statistically similar between the 2 groups. However, patients receiving TPN in the immediate postoperative setting were found to have a significantly higher rate of bacteremia (9% vs 1%, $P < 0.05$). Similar to our study, Roth and colleagues prospectively reported an increase in infectious complications with no improvement in gastrointestinal function in patients receiving TPN following radical cystectomy and urinary diversion.¹⁰ Additionally, Meffezini et al found that early TPN after radical cystectomy did not appear to improve nutritional parameters or return of bowel function in an elderly population.¹¹

An estimated 200,000 nosocomial bloodstream infections occur each year—90% related to the use of central venous cath-

eters.¹⁶ In addition, TPN administration has been found to be a significant risk factor for central venous catheter infection, possibly related to hyperglycemia.¹⁷⁻²⁰ In our study, we did find a significant increase in bloodstream infections in our cohort that received immediate postoperative TPN. Uncontrolled hyperglycemia, however, was not different between the 2 groups. We do acknowledge that our definition of uncontrolled hyperglycemia (any glucose level >200 on 3 readings) may not have captured all hyperglycemia episodes.

There are several limitations to our study. First, our investigation was retrospective and, therefore, subject to confounding variables and biases associated with such a design. Second, there was a potential bias as 1 surgeon (WS) preferentially used immediate postoperative TPN with all cystectomy and diversion patients. Preoperative demographics between the 2 groups, however, were similar. Furthermore, the collection of pre- and postoperative nutritional parameters would have been useful to better assess the potential benefits of TPN. Unfortunately, nutritional parameters only were checked in select (presumed malnourished) patients, not all patients. Despite the limitations of our study, our findings spanning an 8-year period suggest that immediate TPN does not provide a significant recovery benefit following open cystectomy and urinary diversion.

CONCLUSION

Immediate administration of TPN after radical cystectomy does not provide a significant postoperative benefit and appears to contribute to an increased risk of bacteremia in the early postoperative period. Our findings do not support, and we no longer routinely use, immediate postoperative TPN following cystectomy and urinary diversion.

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