Fast-track management is safe and effective after bowel resection in children with Crohn's disease

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**Abstract**

Background: “Fast-track” management (FT) challenges traditional postoperative tenets in order to minimize discomfort and optimize inpatient care. We examined the outcomes of consecutively performed laparoscopic-assisted ileocecectomy for Crohn’s disease (CD), with particular focus on FT’s effects in patients with underlying bowel inflammation.

Methods: We retrospectively reviewed all patients undergoing isolated laparoscopic-assisted ileocecectomy for CD at our institution between 12/2000 and 12/2010, excluding patients with multiple areas of surgical CD, bladder involvement, or age > 18 years. Results: Seventy-one patients aged 8-18 years underwent isolated laparoscopic-assisted ileocecectomy for CD, of which 45 met FT criteria. Individual practice patterns primarily determined which patients were FT-managed. FT management led to decreased length of stay (LOS), time to first stool, time to full diet, and intravenous narcotic use. No significant difference in complications or disease progression was observed between the two groups during 2-year follow up.

Conclusions: Our results suggest that FT is safe and effective in patients with CD. In a chronically ill population, counseling patients and families to expect early discharge is critical to the success of this strategy. Despite CD-related GI pathology, FT patients realized benefits in terms of LOS, time to bowel function, and narcotic use without any increase in complications.

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Fast-track management refers to a comprehensive philosophy of aggressive peri- and postoperative care that challenges traditional postoperative tenets in order to minimize discomfort and optimize inpatient care. First described by Henrik Kehlet [1-5], fast-track management streamlines therapy by emphasizing early feeding, eliminating drains, tubes and catheters, minimizing narcotic use and utilizing minimally invasive techniques whenever possible. This strategy is well established in adult surgery [6-9] and recent trials have established its efficacy in pediatric patients [10,11], reducing length of hospital stay and narcotic usage while preserving good pain control. Fast-track management has been evaluated in several specific pediatric surgical procedures, including GI procedures such as appendectomy [12], fundoplication [11], and colectomy [13]. However, such studies routinely exclude children with concomitant disease, who might also benefit from fast-track principles. Though children with co-morbid conditions may present unique perioperative risks, pediatric patients with chronic illness are at higher risk for social isolation and school absence [14,15] making them particularly likely to benefit from the shorter hospitalization associated with fast-track management. Some of these patients have pain control issues, and care providers might be inclined to proceed cautiously with diet advancement or early mobilization owing to their underlying disease. Because fast track management relies heavily on early postoperative feeding and minimization of narcotics, patients with abnormalities in gastrointestinal physiology might be at increased risk for complications. We have applied fast-track strategies in pediatric patients with Crohn’s disease who have undergone bowel resection and primary anastomosis. In this retrospective study, we examine the outcomes of consecutively performed laparoscopic-assisted ileocecectomy for Crohn’s disease, with particular focus on the effect of a fast-track approach in patients with underlying bowel inflammation.

1. Patients and methods

We retrospectively reviewed all patients undergoing isolated laparoscopic ileocecectomy for Crohn’s disease at our institution between December, 2000 and December, 2010. Cases were identified based upon CPT codes for laparoscopic ileocecectomy (44160 and 44205) and cross-referenced for ICD-9 diagnosis codes associated with Crohn’s disease (555.1, 555.9). Procedures were performed by five surgeons and individual practice patterns primarily determined which patients were managed in accordance with fast-track principles. Critical components of our fast-track protocol include: oral
intake within 24 hours postoperatively, no routine nasogastric tube, rectal suppository on post operative day 2 if no spontaneous stool, and minimization of narcotics using alternative pain medications, including non-steroidal anti-inflammatory drugs (NSAIDs). All patients and families were counseled preoperatively on the planned strategy and the criteria for early hospital discharge, including specific milestones, were discussed.

All patients who underwent laparoscopic ileocecectomy for Crohn’s disease during the study period were considered for inclusion. Exclusion criteria included patients with multiple areas of surgical Crohn’s disease, bladder involvement and age >18 years. Of patients aged 18 years or less, ten patients were excluded based upon these criteria. Intravenous narcotic use was calculated in mg morphine/kg using equi-analgesic dose equivalents, and ketorolac was routinely used to decrease narcotic requirements. Drains, tubes and catheters were not used empirically in any patient in the fast-track group.

Data were collected regarding presenting symptoms, surgical indications, preoperative immunosuppression, postoperative pain control and NSAID use, chronicity of symptoms, urgency of operation, operative/anesthetic time, as well as time to oral intake, return of bowel function, and postoperative disease-related complications, including flares. Follow-up data were collected through two years postoperatively. Data were analyzed using a 2-tailed student’s T test with unequal variance. Following normality analysis, non-parametric data were analyzed using the Mann Whitney U test for continuous variables and the Fisher’s Exact test for categorical variables. Statistical significance was set at p < 0.05.

2. Results

Seventy-one patients ranging in age from 8 to 18 years underwent isolated laparoscopic ileocecectomy for Crohn’s disease and met inclusion criteria, of which 45 met fast-track criteria and 26 were conventionally managed. Mean age in the fast-track (FT) group was 14.6 years (range 8–18) vs. 15.3 years (range 10–18) in the conventionally managed group. There was a slight male predominance in the FT group (27 male vs. 18 female), while conventionally managed patients were evenly divided (13 male vs. 13 female). There was no significant difference in the number of preoperative Crohn’s medications (median = 3; range 1–4 in both groups) or duration of treatment. However, 26 of 45 FT patients (57%) were treated with preoperative corticosteroids, while 21 of 26 conventionally managed patients (81%) received this therapy (p = 0.04). Likewise, 5 of 45 FT patients (11%) required monoclonal antibody therapy (Infliximab or Adalimumab) while 6 of 26 non-FT patients (23%) received such treatment, though this difference did not reach statistical significance (p = 0.22) (Fig. 1).

The median interval between disease presentation and surgical resection was 1.5 years in both FT and conventionally managed groups (mean 2.28 vs. 2.19 years, range 0–7 years). Though FT patients had shorter OR times, on average (126 vs. 174 min, p < 0.01), fluid administration was comparable when adjusted for time (0.71 vs. 0.8 L/h, p = 0.28). All procedures were performed using a laparoscopic technique, and nearly all anastomoses were stapled. Hand-sewn intracorporeal anastomoses were performed for two patients in the conventionally managed group. Primary anastomoses were performed in all patients.

Though 13 of 45 FT patients experienced postoperative emesis, only one required NG tube replacement. Length of stay for FT patients averaged 3.7 days vs. 5.0 days for the non-FT cohort (p < 0.01). Likewise, time to first stool averaged 2.2 vs. 3.3 days (p < 0.01); time to full diet 2.1 vs. 3.7 days (p < 0.01) and intravenous narcotic use averaged 1.4 vs. 2.9 mg/kg (p = 0.03) (Fig. 2). Among FT patients, there was a significant difference in length of stay between those patients receiving oral nutrition immediately postoperatively (day 0) and those who did so on post-operative day 1 (3.05 vs. 4.24, p < 0.01), without any difference in postoperative emesis or complications.

Two patients in each group required bowel function-related readmission. Twenty-three patients experienced complications (Table 1); no significant difference in complications (15 of 45 fast-tracked patients vs. 8 of 26 conventionally managed patients, p = 1) or disease progression (8 of 45 vs. 4 of 26) was observed between
groups during median follow-up of two years. Small bowel obstruction (SBO) was more common in the fast-track group (p = 0.15), though only two occurred within 6 months of surgery and three were partial small bowel obstructions amenable to medical management. One patient required lysis of adhesions seven months postoperatively, and was found to have an adhesive obstruction at a site distant from the anastomosis. The time to stool in the patients who later developed obstructions was not delayed (range 1–3 days) and all had stooled before discharge. Follow-up information was unavailable beyond the first postoperative appointment for three patients in each group who were managed by gastroenterologists associated with other institutions. Fifteen fast-tracked patients underwent urgent/emergent resection for highly active and refractory disease, and no increase in complications was observed (11 of 30 elective vs. 4 of 15 urgent/emergent).

3. Discussion

Though pediatric onset of Crohn’s disease is less common than adult onset, early presentation naturally increases the likelihood that bowel resection will be required. In pediatric patients, the terminal ileum is frequently involved, making ileocecectomy among the most common surgical interventions performed in this population. Laparoscopic-assisted ileocecectomy has been shown to be safe and effective for segmental Crohn’s disease in adult [16,17] and pediatric [18–20] patients. Among the most compelling arguments for the introduction of minimally invasive approaches for pediatric Crohn’s resection is the associated decrease in length of hospital stay [20]. Fast-track peri- and postoperative management is the logical extension of this advance and holds potential to further decrease hospital stays, narcotic requirements and costs for this chronically ill population.

Despite the potential benefits, early feeding and the elimination of drains represent an aggressive approach to postoperative management following bowel surgery and the fear of some inherent increased risk in patients with co-morbid conditions, including Crohn’s, has led to the exclusion of this group from studies of fast-track management’s safety and efficacy. Fast-track management is based upon the idea that early nutrition may limit the inhibitory neural sympathetic visceral reflexes and the intestinal inflammatory response [1]. We have specifically studied these interventions in a population with an underlying pro-inflammatory state of the bowel and likely abnormalities in mucosal stress signaling [21,22], in order to determine whether these patients respond similarly to healthy patients with respect to paralytic ileus and other relevant surgical outcome measures.

Patient and family education is critical to the success of any fast-track program, and perhaps even more so in the setting of Crohn’s disease when patients may have endured prolonged or multiple hospitalizations. During preoperative discussion, patients should be counseled regarding the postoperative management plan and expected length of stay to ensure that their early discharge is not perceived as rushed or premature. Furthermore, appropriate education must be provided regarding potential complications and concerning symptoms in order to avoid any delay in presentation.

We chose to standardize our patient population to those undergoing a single laparoscopic procedure in order to decrease confounding variables and to separate the effect of fast-track postoperative management from that of the minimally invasive approach alone. Overall, fast-tracked patients realized benefits in terms of length of stay, time to bowel function and narcotic use, without any statistically significant increase in complications. SSI was the most common complication in both groups, though all but one were superficial. None of the conventionally managed patients experienced a small bowel obstruction (SBO) during the two-year follow-up period, but this difference likely reflects the small sample size and did not reach statistical significance. No statistically significant relationship was observed between SBO and NSAID use. In this patient population with chronic inflammatory pathology, it is difficult to draw direct causative links between surgical intervention and delayed SBO. Though such complications can occur as a consequence of leak or abscess during the early postoperative period, these patients were not noted to have any differences in postoperative course and the only obstruction which required operative treatment did not occur near the anastomosis. Time to stooling should inform the assessment of leak potential, and delayed return of bowel function during fast track management certainly merits investigation. For the small number of patients who may be discharged after return of flatus but prior to stooling, patients and families should be counseled to notify the surgeon of any concerning signs of symptoms (fever, nausea, abdominal pain), or if stooling does not occur within 24–48 hours of discharge. Overall, the decrease in hospital stay provides system-based benefit in terms of cost savings and potentially fewer lost work hours for family members, while offering improved patient comfort, reducing exposure to hospital-acquired infections, and decreasing social isolation among these chronically ill adolescents.

Ketorolac was routinely used in order to decrease narcotic use in fast tracked patients and the decreased narcotic use in these patients likely reflects not only a benefit of the fast track method, but an important component of its successful implementation. Many alternative pain management strategies have been described in fast-track surgery, including loco-regional anesthesia, epidural or spinal anesthesia, as well as non-narcotic adjuncts including non-steroidal anti-inflammatory drugs. This class of medications raises particular issues in the context of Crohn’s disease, as NSAIDs have been associated with onset or relapse of colitis in patients with newly diagnosed or chronic inflammatory bowel disease [23,24]. These agents have been postulated to predispose patients to flares through a mechanism involving inhibition of protective prostaglandins and/or mitochondrial oxidative

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Table 1

| Complications experienced following laparoscopic ileocecectomy for Crohn’s disease. |
|----------------------------------|----------------|----------|----------|----------|----------|--------|
|                                   | Bleeding | SSI       | Abscess | Stricture | Fistula | SBO     | Other readmission |
| Fast-track (n = 45)               | 2        | 5         | 1       | 2         | 0       | 4       | 2                |
| Conventional (n = 26)             | 0        | 2         | 1       | 1         | 1       | 0       | 2                |
| p value                           | 0.40     | 0.49      | 0.60    | 0.70      | 0.37    | 0.15    | 0.47             |
References


Discussion

Discusant: Dr Ann O’Connor (Chicago, IL): I just had a question about your four patients that were trending towards small bowel obstruction. Can you explain a little bit about what that is and did that influence their length of time in the hospital being longer than your other fast track patients?

Response: Dr Jesse Vrevenak: There was one patient who had a nasogastric tube placed at the initial admission, and was found to have a partial small bowel obstruction that did increase the duration of that admission to nine days. There was another that was a relatively early small bowel obstruction or partial small bowel obstruction I should say, but other two were actually late, over a year, which I would think would make that less likely to be related to their initial postoperative management.

Discusant: Dr Donald Meier (El Paso, TX): What are your discharge criteria on the fast track? What if they don’t respond to your suppository at two days? Do you wait for them to stool? How do you decide?

Response: Dr Jesse Vrevenak: There were a handful of patients who were discharged before formal stooling although evidence of bowel function as shown by presence of flatus and other things would be criteria for allowing those patients to go home, but patients do need to tolerate a regular diet without emesis or concern for small bowel obstruction. They need to be mobilized. They need to be able to void spontaneously and generally be ready to go home. Over the course of this ten-year period, that time has actually crept down a little bit so the earlier ones trended more towards 3–4 day range and more recently it is trending more towards 2–3 days.

Response: Dr Thomas Tracy (Providence, RI): Congratulations on a great program. I think that one of the best parts of your program is the preoperative education, the family education, the patient education. There are a large number of satisfaction studies that could be done out of this. Did you do any patient care satisfaction studies?

For those of us that are worried about the bills in the hospital, decrease in length of stay even to half a day can equal millions of dollars. However, those extra days are crucial in the hospital.
dollars to your institution. Have you done any cost analysis or payment analysis relative to this fast track group?

Response: Dr Jesse Vrecenak: Thank you. Both of those are certainly excellent questions and things that I would like to do. We have not done any quality studies on our patients, although the adult group that I mentioned has done those quality follow up studies and shown excellent satisfaction for both patients and families in their patient population. Likewise, we have not done a cost analysis on this data, although I would expect that there should be significant cost savings. Our mean length of stay in the fast track patients over the 10-year period was 3.7 days compared with 5.5 days, so it is actually over a full day.

Discussant: Dr Kurt Newman (Washington, DC): I compliment you on your strategy here and your careful analysis, the transparency of your data and the long-term follow up. However, in response to your explanation perhaps of the four patients in a very small study which lacks as you mentioned statistical power, it is concerning and then I think to – I wouldn’t be so quick to dismiss the two late follow ups. For example, although we all want to believe this and this is a great way to focus on the patient experience and I commend you on that, but it’s possible for example that an early leak, and because of the approach, may lead to those bowel obstructions. Obviously more patients are needed to be followed along with this to be sure that this is just a statistical anomaly and not related to a difference in your strategy.

Response: Dr Jesse Vrecenak: Sure. We did not see any evidence of increased leaks in that early period. Only one of those small bowel obstructions actually required operation in the long term. The other again was a partial that was managed with a short readmission and NG tube.