A Comparative Study of Fast-Track Versus Conventional Surgery in Patients Undergoing Laparoscopic Radical Cystectomy and Ileal Conduit Diversion: Chinese Experience

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Fast-track surgery (FTS), which combines various techniques with evidence-based adjustments, is aimed to reduce postoperative morbidity, attenuate surgical stress response, thereby accelerating recovery and shortening length of stay. To further investigate the effectiveness of fast-track surgery, we compared the short-term outcomes of laparoscopic radical cystectomy and ileal conduit diversion for Chinese bladder cancer patients with FTS or with CS in our hospital. Patients with bladder cancer were included and divided into two consecutive groups: CS group and FTS group. Duration to first flatus and regular diet, postoperative hospital days, hospital expense, incidence of complications and postoperative surgical stress response were compared. There was no significant difference between the two groups in age, sex, BMI and postoperative TNM classification. Compared with the CS group, the FTS group had significantly shorter duration to first flatus, time to regular diet, postoperative hospital days and hospital expense, less complications, lower white blood count (WBC) and serum of C-reactive protein (CRP) on postoperative day 5 and 7. Our study indicates that FTS program is safe and efficacious for Chinese patients undergoing laparoscopic radical cystectomy and ileal conduit diversion. It can accelerate recovery, reduce stress action, shorten postoperative hospitals days and reduce hospital expenses.

Bladder cancer is the second most frequent tumor of the genitourinary tract in Chinese adults. Radical cystectomy, which is usually followed by some form of intestinal urinary reconstruction, is recognized as the standard treatment for muscle-infiltrating bladder cancer and even high-risk, recurrent, non-invasive bladder cancer. With the widespread use of laparoscopic technique, laparoscopic radical cystectomy and intestinal urinary reconstruction is becoming more and more common.

Radical cystectomy with intestinal urinary reconstruction is thought to be a major operative procedure with potential for substantial morbidity and mortality. The incidence of the disease is still increasing and most of the patients with bladder cancer are elderly people, which means comorbid conditions is common. Thus it is important for us to improve the perioperative management and reduce the morbidity of the procedure.

Fast-track surgery (FTS), also known as enhanced recovery after surgery, was first introduced by Kehlet in colorectal surgical practice. It combines various techniques with evidence-based adjustments, for example, surgical, nursing, and preoperative, intraoperative and postoperative management to reduce postoperative morbidity, attenuate surgical stress response, thereby accelerating recovery and shortening length of stay. It has successfully been applied in hepatobiliary, vascular and colorectal operations. Besides, it has been showed to be effective in urologic operations, including radical cystectomy, radical prostatectomy and open partial nephrectomy in western populations.

In our department, ileal conduit diversion is the main form of intestinal urinary reconstruction. To further investigate the effectiveness of fast-track surgery, we compared the short-term outcomes of laparoscopic radical cystectomy and ileal conduit diversion for Chinese bladder cancer patients with FTS or with CS in our department.
Urinary reconstruction is recognized as a major operative procedure improving quality of care. Radical cystectomy with intestinal urinary reconstruction is still limited, especially in laparoscopic radical cystectomy and ileal conduit diversion. In this study, we compared the short-term outcomes of laparoscopic radical cystectomy and ileal conduit diversion for Chinese bladder cancer patients with FTS or with CS in our hospital. The results indicated that the application of FTS program in patients undergoing laparoscopic radical cystectomy and ileal conduit diversion accelerated postoperative recovery with less complications, shortening postoperative days.

An early institution of oral diet is the most important component of the FTS program. Traditionally, patients undergoing laparoscopic radical cystectomy and intestinal urinary reconstruction were only allowed to consume liquid after flatus passed. However, in the FTS program, early institution of oral diet is encouraged. It has been reported that gum-chewing can stimulate bowel movement and decrease the incidence of paralytic ileus after gastrointestinal surgery, while also increasing patients’ satisfaction. It has been reported that opium analgesics have the potential to lead to nausea, fatigue and vomiting. Therefore, celecoxib was used in the FTS group instead of opium analgesics.

In the FTS group, postoperative fluid infusion was contained. Too much fluid will delay the return of the function of bowel and increase the risk of heart failure. Under the premise of maintaining basal vital signs, reducing amount of fluid will not only relieve patient’s pain, but also lower costs.

Postoperative stress response is an important factor for delayed recovery and affected organ function. Several measures were adopted to minimize the stress response, for example, the use of metoclopramide and celecoxib in the FTS group. We can evaluate the level of postoperative stress response by measuring WBC counts and CRP levels in the plasma. In our study, only 3 patients had nausea or vomiting in the FTS group. Using metoclopramide laid a solid foundation for early institution of an oral diet.

Early ambulation is an important step in the FTS program. Early ambulation can decrease the incidence of pulmonary and coagulation complications, enhance the recovery of bowel function, thus accelerate recovery. Most patients were elderly people who are afraid of ambulation. So it is especially important to encourage patients to mobilize out of bed as early as possible. In the FTS group, no patients had pneumonia or deep venous thrombosis. In the CS group, 2 patients had pneumonia and 1 patient had DVT.

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In the FTS group, time to first flatus was shorter than that in the CS group. In addition, our study shows a tendency to reduction in postoperative hospital days in the FTS group. By shortening post-

Table 1 | Demographic and clinical data of the patient cohort

|                | FTS group (n=60) | CS group (n=55) | P value |
|----------------|------------------|-----------------|---------|
| Male/female    | 53/7             | 49/6            | 0.898   |
| Age(years)*    | 60.3±8.5(40-79)  | 59.95±8.86(40-78)| 0.820  |
| Mean BMI       | 23.6±2.2         | 23.49±2.05      | 0.717   |
| TNM classification |
| T1N0M0         | 26(43.3%)        | 24(43.6%)       | 0.948   |
| T1N1M0         | 24(40.0%)        | 23(41.8%)       |         |
| T2N1M0         | 10(16.7%)        | 8(14.5%)        |         |

*Mean ± SD(range); FTS: fast-track surgery; CS: conventional surgery; BMI: body mass index (calculated as Kg/m²).
operative hospital days, we can improve medical efficiency and utilization rate of health resources. After an introduction of FTS program, hospital expenses were reduced and patients were more satisfied.

This study had several limitations that may have influenced the results. Our sample size is small and duration time of follow-up is short. Randomized controlled trial may be needed to further compare FTS program with CS program. FTS program itself can also be improved. For example, 3D laparoscopic appears to enhance laparoscopic proficiency26. Further studies may be focused on the use of 3D laparoscopic in radical cystectomy with intestinal urinary reconstruction.

In conclusion, The present study indicates that the FTS program can accelerate recovery, reduce stress action, shorten postoperative hospital days and reduce hospital expense. The FTS program is more safe and efficacious than CS program for Chinese patients undergoing laparoscopic radical cystectomy and ileal conduit diversion.

Methods

The methods were carried out in accordance with approved guidelines. The study was approved by the Ethics Review Board of Xianga Hospital. The informed consent was obtained from all patients. From March 2011 to February 2012, 55 patients took laparoscopic radical cystectomy and ileal conduit diversion in the department of urology, Xianga Hospital with curative intent. All of them received CS program. From March 2012 to February 2013, 60 patients took laparoscopic radical cystectomy and ileal conduit diversion in our department with curative intent. All of them received FTS program. Preoperative evaluation and inspection, including medical history, physical examination, imagine examination, ECG, cystoscopy with tissue biopsy, laboratory blood tests were performed in all patients before operations. All of them were diagnosed with muscle-infiltrating bladder cancer. Laparoscopic radical cystectomy and ileal conduit diversion and the perioperative management were carried out by the same team of surgeons with rich experience. Postoperative results were reported by the same team of surgeons with rich experience.

Table 2 | Operative details and outcomes

|                      | FTS group (n=60) | CS group (n=55) | P value |
|----------------------|------------------|----------------|---------|
| EBL (ml)             | 204.5 ± 63.47    | 203.45 ± 71.83 | P=0.934 |
| Duration to first flatus (d) | 2.92 ± 0.83     | 3.75 ± 0.78    | P=0.000 |
| Duration to regular diet (d) | 4.43 ± 0.83     | 6.84 ± 0.92    | P=0.000 |
| Postoperative hospital days (d) | 6.9 ± 1.1       | 10.0 ± 1.5     | P<0.001 |
| Hospital expense (10000 RMB) | 4.87 ± 0.57     | 5.92 ± 0.52    | P=0.000 |
| Pain* (n)            | 4                | 28             |         |
| Minor Complications (n) |                 |                |         |
| nausea               | 2                | 5              | P=0.000 |
| vomiting             | 1                | 4              |         |
| ileus                | 1                | 2              |         |
| pneumonia            | 0                | 2              |         |
| Wound infection      | 1                | 1              |         |
| UTI                  | 0                | 2              |         |
| DVT                  | 0                | 1              |         |

*number of patients who needed opium analgesics; FTS: fast-track surgery; CS: conventional surgery; EBL: estimated blood loss; DVT: deep venous thrombosis; UTI: urinary tract infection.

Table 3 | WBC and CRP in two groups

|                  | WBC (×109/L) |                      |                      |                      |                      |                      |
|-------------------|--------------|----------------------|----------------------|----------------------|----------------------|----------------------|
|                   | Preoperative | POD1                 | POD2                 | POD3                 | POD5                 | POD7                 |
|                   | FTS group    | CS group             | FTS group            | CS group             | FTS group            | CS group             |
|                   | 6.17 ± 1.77  | 15.14 ± 4.81         | 13.19 ± 2.68         | 8.76 ± 0.78          | 6.66 ± 0.56          |                      |
|                   | 6.25 ± 1.78  | 15.56 ± 3.66         | 13.45 ± 2.58         | 11.45 ± 1.2          | 8.72 ± 1.15          |                      |
|                   | P=0.05       | P=0.05               | P=0.05               | P=0.05               | P<0.05               | P<0.05               |

Table 3 | WBC and CRP in two groups

|                  | CRP (mg/L) |                      |                      |                      |                      |                      |
|-------------------|-----------|----------------------|----------------------|----------------------|----------------------|----------------------|
|                   | Preoperative | POD1                 | POD2                 | POD3                 | POD5                 | POD7                 |
|                   | FTS group    | CS group             | FTS group            | CS group             | FTS group            | CS group             |
|                   | 2.11 ± 2.23 | 15.14 ± 4.81         | 13.19 ± 2.68         | 8.76 ± 0.78          | 6.66 ± 0.56          |                      |
|                   | 2.06 ± 1.65 | 15.56 ± 3.66         | 13.45 ± 2.58         | 11.45 ± 1.2          | 8.72 ± 1.15          |                      |
|                   | P=0.05       | P=0.05               | P=0.05               | P=0.05               | P<0.05               | P<0.05               |

WBC: white blood cell, CRP: C-reactive protein; FTS: fast-track surgery; CS: conventional surgery; POD: postoperative day.
### Data collection. Duration to first flatus, time to regular diet, postoperative hospital stay (recorded as postoperative days) and hospital expenses were recorded. WBC counts, levels of CRP was measured from one day before surgery to POD 1, 3, 5 and 7. Number of complications were recorded. Surgical-related data such as estimated blood loss were also recorded.

### Statistical analysis. For descriptive statistics, we presented our data as mean ± standard deviations and counts or frequencies with percentages or proportions for categorical variables. Differences between two groups were made using a Student’s t-test. Categorical measures were analyzed using chi-square analysis. A P value <0.05 was considered statistically significant. Data was made with SPSS version 15.0 for Windows (SPSS, Chicago IL).

### Table 4 | FTS and CS program of patients undergoing laparoscopic radical cystectomy and ileal conduit diversion

|                        | FTS group                                           | CS group                                           |
|------------------------|-----------------------------------------------------|----------------------------------------------------|
| Preoperative education | Counselling regarding the FTS program               | Information about the operation                    |
| Preoperative bowel preparation | Clear liquid diet one day prior to the operation 139.12 g polyethylene glycol preparation mixed with 1 L of water in the afternoon prior to the operation A mandatory overnight 12h fast was kept pre-operatively No mechanical bowel preparation | Metronidazole (oral 0.4g tid 3d) and gentamicin (oral 8wU tid 3d) were taken Semiliquid diets on the third day before surgery Clear liquid diet on the second day before surgery A 24h fast were kept on the first day before surgery A mechanical bowel preparation were given in the night before surgery |
| Postoperative fluid infusion | I.V. infusion of 1000–2000ml per day for 2–3 days | I.V infusion of 3000–5000ml in the day of surgery. I.V infusion of 3000ml fluid per day in the next 4–5 days |
| Postoperative pain control | Celecoxib (oral 200mg bid) | Opium analgesics were given in the presence of intolerable pain. |
| Postoperative ambulation | Patients were encouraged to mobilize out of bed metoclopramide (10mg im q8h) for 48 hours in order to prevent vomiting and nausea | Patients’ ambulation was based on their own desire Patients were only allowed to consume liquid and diet after flatus passed. |

FTS: fast-track surgery, CS: conventional surgery, POD: postoperative day.

### Author contributions
L.Q. conceived of the study, participated in the data collection and wrote the main manuscript. G.X., L.L.F. performed the statistical analysis, participated in the data collection and helped to write the manuscript. X.L., Y.L., M.F.C. participated in the data collection. X.B.Z., W.L. participated in its design. All authors reviewed and approved the final manuscript.

### Additional information
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The original version of this Article contained an error in the title of the paper, where the word “Versus” was incorrectly given as “Verus”. This has now been corrected in both the PDF and HTML versions of the Article.