Multimodal Rehabilitation Programme in Elective Colorectal Surgery. Development of a Clinical Pathway and Preliminary Results

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Abstract

Introduction. Multimodal rehabilitation programmes enhance recovery and may reduce the postoperative complication rate and hospital stay after elective colorectal surgery.

Patients and method. A clinical pathway of multimodal rehabilitation in elective colorectal surgery was developed. After implementation, 90 consecutive patients received multimodal rehabilitation care from April to December 2006. Outcomes were compared with a control group of 134 patients receiving conventional care during 2005, just before the implementation of the new protocol. Demographics, surgical risk and type of surgery were similar in both groups.

Results. With a clinical pathway of multimodal rehabilitation, on postoperative day 1 mobilization was accomplished in 68% of patients, early feeding in 52%, diet was well tolerated in 33% and intravenous fluids were stopped in 21% of patients. On postoperative day 5 predetermined discharge criteria were fulfilled in 82% of patients, although only 55% were discharged by postoperative day 6. Adherence to antibiotic prophylaxis protocol was better in the multimodal rehabilitation group (90% vs 41%; P < 0.001). Postoperative wound infection was lower in the multimodal rehabilitation group (8.8 days vs 11.9 days; P = 0.03) with a mean of 6 days versus 9 days respectively.

Conclusions. A clinical pathway of multimodal rehabilitation in elective colorectal surgery reduces hospital stay without increasing morbidity rates.

Key words: Multimodal rehabilitation. Fast-track. Colorectal surgery. Clinical pathway.

REHABILITACIÓN MULTIMODAL EN CIRUGÍA COLORRECTAL ELECTIVA. ELABORACIÓN DE UNA VÍA CLÍNICA Y RESULTADOS INICIALES

Introducción. Los programas de rehabilitación multimodal (RHMM) optimizan los cuidados perioperatorios, pueden reducir las complicaciones y acortan la estancia hospitalaria.

Pacientes y método. Elaboración de una vía clínica de cirugía colorrectal electiva basada en un programa de RHMM. Entre abril y diciembre de 2006 se ha incluido a 90 pacientes consecutivos tratados con el protocolo de RHMM. Los resultados se comparan con los de un grupo control de 134 pacientes intervenidos durante el año 2005 antes de su implantación. Las características demográficas, el riesgo quirúrgico y el tipo de intervención fueron similares en ambos grupos.

Resultados. Con el programa de RHMM se consiguió, el primer día del postoperatorio, la movilización del 68% de los pacientes, el inicio de dieta en el 52%, la tolerancia a ésta en el 33% y se retiró la sueroterapia al 21% de los pacientes. En el quinto día del postoperatorio el 82% de los pacientes cumplían criterios de alta, aunque sólo se había dado de alta al 55% el sexto día del postoperatorio. El cumplimiento de la profilaxis antibiótica fue mejor en el grupo de RHMM (el 90 frente al 41%; p < 0.001). Las complicaciones...
Introduction

Until recent years, postoperative treatment of patients who undergo colorectal surgery has been based more on habit than on scientifically demonstrated facts. With these treatment guidelines, postoperative hospital stays vary between 10 and 15 days. Multidisciplinary action proposals have been published in the last decade that are designed to reduce stress secondary to surgical damage, improve postoperative progress and, in this way, reduce hospital stays. These protocols have been shown to be safe in the first phase since they have not increased postoperative morbidity.1,3 Later, it has been shown that by applying these protocols, it is possible to reduce postoperative complications and shorten the hospital stay.4 These benefits are maintained in patients with increased comorbidities.5

The colorectal surgery unit in our hospital decided to create a multimodal rehabilitation programme (MMRH) based on the ERAS project (Enhanced Recovery After Surgery)6 in order to apply it to elective colorectal surgery. The final product and the results obtained in the first 90 patients are included in this paper, which are compared to a cohort of patients who underwent surgery immediately prior to implementation of the MMRH program.

Patients and Method

Study Design: Prospective Study Comparing 2 Consecutive Cohorts

The inclusion criteria were: patients who will undergo elective surgery of the colon and rectum. Exclusion criteria have not been established so that the results would correspond to regular clinical practice.

Creation of the Protocol and the Clinical Pathway

After several meetings with the departments involved, a consensus action protocol was created based on the ERAS project, adapting it to our centre. The final result took the form of the clinical pathway with an executive time matrix (www.hospitaldelmar.cat/usuaris/indexcircugienenal.html). Before being put into effect, information sessions were carried out in all of the departments.

Description of the MMRH Protocol

The protocol described is divided by the time of its application: preoperative, intraoperative, and postoperative periods.

Preoperative. Verbal and written information to the patient highlighting the importance of his/her active participation in the process. This information is provided by the surgeon and the nurse in outpatient consultation. Preparation of the colon with polyethylene glycol. Preoperative enteral nutrition: Edanec® 3000 mL (120 g of carbohydrates) and oral hydration until 6 hours prior to surgery. Intravenous antibiotic prophylaxis: metronidazole 1 g and gentamicin 240 mg when leaving the operating theatre.


Postoperative. Multimodal postoperative analgesia: epidural catheter with local anaesthetics and continuous infusion of opiates for 48 h. Intravenous analgesia with nonsteroidal anti-inflammatory drugs and paracetamol alternated every 4 hours. Water intake starting at 6-8 h after surgery. A progressive diet beginning on the first day after surgery. Discharge criteria: Tolerance to a solid diet, pain is controlled with oral analgesia and correct patient mobilisation.

MMRH Group

The first 90 patients to which the protocol was applied from April until December 2006.

Control Group

Hundred thirty-four patients who underwent elective colon and rectal surgery in 2005 were included in the group. In this group, perioperative care was carried out in the usual manner prior to the MMRH programme. The following differences in tasks are highlighted: a) anterograde preparation of the colon with Fosfosoda®; b) parenteral hydration during preparation; c) intravenous antibiotic prophylaxis (amoxicillin-clavulanic acid 2 g at the beginning of surgery and 1 g at 2 hours); d) no preoperative enteral nutrition; e) preoperative hydration (10-14 mL/kg/h); and f) initiation of diet following restoration of peristalsis.

Variables Analysed

The following variables were specifically evaluated in this study: a) rate of protocol compliance; b) rate of postoperative complications up to 30 days after surgery; and c) hospital stay and readmissions.

Statistical Analysis

A descriptive analysis of the variables described is performed using the number and percentage of events in addition to calculation of medians for central tendency and dispersion. Analytical statistics are applied in order to compare the groups using the Fisher χ² test for the categorical variables and the t test is used for the continuous variables.

Results

Between January 2005 and March 2006, the MMRH protocol was created and the clinic’s documentation needed in order to begin its use in April 2006 was designed. Between April and December 2006, 90 consecutive patients were included. The demographic and clinical characteristics of these patients were not different than those in the control group (Table 1).

Rate of MMRH Protocol Compliance

Anaesthesia protocol. Compliance with the anaesthesia protocol was achieved in 95% of patients. The volume of fluid administered to the MMRH patients in the preoperative period was significantly less than in the control group (2280 [1750] vs 3700 [1900] mL; P<.001).

Antibiotic protocol. Correct administration of antibiotic prophylaxis in the MMRH group reached 90%, versus 41% in the control group (P<.001).
Diet and mobilisation. Progression of mobilisation and diet is shown in Figure. On the first postoperative day, mobilisation was achieved in 68% of patients; diet was initiated in 52% of patients, and tolerated in 33% of patients; fluid therapy was able to be suspended in 21% of patients.

On the fifth postoperative day, 82% of patients met the criteria for discharge; however, only 55% of patients were discharged by the sixth day.

Rate of Postoperative Complications up to 30 Days After Surgery

Table 2 demonstrates the morbidity and mortality compared between the 2 groups. There were no differences in overall morbidity (33.3% vs 34.3% in the MMRH and control groups, respectively). This morbidity rate includes the rate corresponding to readmissions. We also did not see differences in the percentages of medical and surgical complications. Among the surgical complications, infection of the surgical site was 6.1% lower in the MMRH group, though the difference was not statistically significant. The same table shows the percentages that correspond to infection of the surgical site and organ-space.

There were 7 re-operations in the MMRH group (2 cases of anastomotic dehiscence, 2 eviscerations, 2 mechanical bowel obstructions, and 1 postoperative haemorrhage) and 8 in the control group (4 cases of anastomosis dehiscence, 3 cases haemoperitoneum, 1 ischemia of the lower extremity), a difference that was not statistically significant (P=.59).

Mortality was lower in the MMRH group, though the difference also did not achieve statistical significance. One patient in the MMRH group expired after bronchoaspiration on the fourth postoperative day, while 5 patients in the control group expired during the perioperative period: 2 patients following respiratory complications, 1 due to heart failure and 2 patients due to dehiscence of the anastomosis.

Hospital Stay and Readmissions

As shown in Table 3, the median postoperative hospital stay was significantly lower in the MMRH group (8.8 [6.6] vs 11.9 [13.1] days; P=.03). The median was 6 versus 9 days in the MMRH protocol patients versus those from the previous period. The total hospital stay is shown in the table with the readmission days; the difference of statistical significance is maintained.

There were no differences in the rate of readmission between the 2 patient groups (Table 3); 10 (11.1%) patients from the MMRH group were readmitted after discharge (2 paralytic ileums, 2 infections of the surgical wound, 1 infected ascites, 1 mechanical bowel obstruction, 1 covered evisceration, 1 pyelonephritis, 1 pelvic haematoma, and 1 readmission for social reasons), while there were 10 (7.4%) readmissions in the control group (2 bowel subocclusions, 5 infections of the surgical incision, 2 heart failures, 1 deep vein thrombosis).

The median of the 10 readmissions in the MMRH group was 8.7 (9.2) days after hospital discharge, while the 10 admissions from the control group were 7.8 (5.9) days after discharge, a difference that was not statistically significant (P=.37).
TABLE 2. Morbidity and Mortality Compared Between Groups

<table>
<thead>
<tr>
<th></th>
<th>MMRH (n=90), No. (%)</th>
<th>Control 2005 (n=134), No. (%)</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>Overall morbidity</td>
<td>30 (33.3)</td>
<td>46 (34.3)</td>
<td>NS</td>
</tr>
<tr>
<td>Medical complications</td>
<td>15 (16.6)</td>
<td>23 (17.1)</td>
<td>NS</td>
</tr>
<tr>
<td>Surgical complications</td>
<td>19 (21.1)</td>
<td>34 (26.1)</td>
<td>NS</td>
</tr>
<tr>
<td>Infection of the surgical site</td>
<td>12 (13.3)</td>
<td>26 (19.4)</td>
<td>NS</td>
</tr>
<tr>
<td>Infection of the surgical incision</td>
<td>8 (8.9)</td>
<td>18 (13.4)</td>
<td>NS</td>
</tr>
<tr>
<td>Organ-space infection</td>
<td>4 (4.4)</td>
<td>8 (6)</td>
<td>NS</td>
</tr>
<tr>
<td>Abscess-ascites</td>
<td>2 (2.2)</td>
<td>2 (1.5)</td>
<td>NS</td>
</tr>
<tr>
<td>Anastomotic dehiscence</td>
<td>2 (2.7)</td>
<td>6 (4.8)</td>
<td>NS</td>
</tr>
<tr>
<td>Mortality</td>
<td>1 (1.1)</td>
<td>5 (3.7)</td>
<td>NS</td>
</tr>
</tbody>
</table>

NS indicates no statistical significance; MMRH, multimodal rehabilitation programme.

α Fisher exact test.

β The percentage of anastomotic dehiscence is calculated in relation to the number of sutures performed: 75 and 125 respectively.

TABLE 3. Hospital Stay and Readmissions

<table>
<thead>
<tr>
<th></th>
<th>MMRH (n=90)</th>
<th>2005 Control (n=134)</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stay, average (SD), d</td>
<td>8.8 (6.6)</td>
<td>11.9 (13.1)</td>
<td>0.03³</td>
</tr>
<tr>
<td>Readmissions, n (%)</td>
<td>10 (11.1)</td>
<td>11 (8.2)</td>
<td>NS²</td>
</tr>
<tr>
<td>Total stay with readmissions, average [SD], d</td>
<td>9.7 (6.9)</td>
<td>13.1 (14.7)</td>
<td>0.04⁴</td>
</tr>
</tbody>
</table>

NS indicates no statistical significance; MMRH, multimodal rehabilitation programme; SD, standard of deviation.

² Student’s t test.

³ χ² test.

Of the patients from the MMRH group who were readmitted, 2 required re-operation (covered evisceration and mechanical bowel obstruction), already included above.

Discussion

Creation of a MMRH programme requires a multidisciplinary team that, using better scientific evidence, reaches a consensus action protocol. Later, all of the professionals involved must be informed in order to carry it out.

Creating and utilizing the clinical pathway with the facility’s own documentation eases the implementation of changes, while creating an executive time matrix makes the process more dynamic by reducing medical orders if the patient progresses as predicted. In addition, the clinical pathway allows the adaptation to the objectives that you wish to achieve.

One aspect that cannot be overlooked is participation by the patients in these protocols. The information they receive, their role as the centre of the process and knowledge of their progress during hospitalisation is crucial in order to achieve the objectives. This is so much so that the Cleveland Clinic group provides the patient with a graph where they must quantify mobilisation and ingestion.

During preparation of the protocol, all of these aspects have been taken into account, which we believe explains 2 findings: first, the long 14-month period until its implementation and second, the absence of serious problems in its implementation.

The first objective of applying a MMRH programme, as shown by other authors, is the safety of its application. In other words, it does not increase morbidity and mortality. Even though we have not found differences in overall morbidity between the 2 groups similar to the findings in other MMRH studies, the reduction in the rate of infection of the surgical site with a tendency towards statistical significance should be pointed out. In our opinion, this reduction is clinically relevant and carries with it a significant reduction in hospital stay. We have also observed a tendency towards a reduction in postoperative mortality.

Once safety has been guaranteed, different measures are proposed for the purpose of facilitating postoperative progress. In the ERAS protocol consensus report, 17 points are proposed, though it is difficult to know the specific importance of each of these points on patient benefit.

One of the most important is compliance with the MMRH protocol. Two points have remained clear: the first is the high level of observance of the anaesthesia protocol and, most importantly, the significant reduction in the administration of fluids during the perioperative period. Our working group, as with other authors, has previously described the relationship between intravenous input, variation in body weight and postoperative complications. The second point has been the consequence of rates higher than 90% in compliance with the antibiotic prophylaxis protocol, the influence of which on the reduction of postoperative infections is unquestionable. A high rate of noncompliance with the antibiotic protocol had already been detected in the centre, not because of lack of knowledge of the protocol, but rather due to missed and delayed administration of the planned doses. This cause was resolved after choosing an antibiotic with a long average life, thereby avoiding the need to repeat the dose during the operation and change the time of its administration (when leaving the operating theatre). These problems are mentioned in the literature, and different strategies to resolve the problem are proposed.

Another aspect, as is common with all MMRH protocols, is the reduction of postoperative paralytic ileum. In order to achieve it, the number of fasting hours prior to the surgery is reduced, administration of parenteral fluids is restricted in the perioperative period, epidural analgesia is administered and diet is reinitiated a few hours after finishing the surgical procedure. In addition, carbohydrate intake in the immediate preoperative period reduces the response to stress and the response to postoperative insulin. On the other hand, early mobilisation and diet, together with a reduction in intravenous fluid administration, reduce loss of muscle mass and changes in body makeup. All of this should result in an acceleration of postoperative recovery.

In the design of the time matrix for the clinical pathway, the automatic execution of all of these steps is laid out chronologically. In this way, the first postoperative day only achieved mobilisation of 68% of patients and diet was initiated in 52%. We believe this is due to a problem with the learning curve or a change in habits and we hope to improve on this in the future. It should be pointed out that intravenous fluid therapy was suspended in 21% of patients on the first postoperative day due to good oral tolerance, something that had not happened in any case during the control period.
Our results demonstrate that paying special attention to these points translates into rapid restoration of the normal physical state, which is confirmed by 82% of patients meeting the clinical criteria for discharge by the fifth postoperative day. However, the time between meeting the criteria for discharge and the discharge taking place is an average of 3 days. It is difficult to analyse the reason for this delay, though it is possibly related to a social problem or insecurity on the part of the patient.

It has been shown that, using the same protocol, surgeons who had experience in multimodal rehabilitation achieved hospital stays that were significantly shorter than those who did not have experience. In this respect, we believe that the results obtained in the first 90 patients are within the learning curve and will improve with an increase in the time of use, as mentioned above.

A critical point in the evaluation of these protocols is the percentage of readmissions. In some studies, very short postoperative stays (48 or 72 hours) have been offset by a very high level of readmissions (20%). The rate of readmission in our study is 11.1%, a rate that is not significantly different from the rate of readmissions in the control group (7.4%). On the other hand, we point out that the majority of readmissions were not serious, which may be related to early discharge.

In summary, the institution of an MMRH programme has allowed for improvement in the rate of compliance with several hospital action protocols and has reduced hospital stay without increasing the rates of morbidity and mortality. Periodical evaluation of the programme, as well as revision, creating benchmarks and defining standards is required in order to create a process of continuous improvement.

References