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<.001). Postoperative wound infection was lower in the multimodal rehabilitation group (13.3% vs 19.4%) with no statistical significance. Median hospital stay was significantly lower in the multimodal rehabilitation group (8.8 days vs 11.9 days; P=.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.
In the colorectal surgery unit in our hospital, a multimodal rehabilitation programme (MMRH) was created in order to begin its use in April 2006. 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).

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 haemopteroneum, 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>Infection</td>
<td>2 (2.7)</td>
<td>6 (4.8)</td>
<td>NS</td>
</tr>
<tr>
<td>Anastomotic dehiscence</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.

*Student t test.

*Fisher exact test.

*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>0.03</td>
</tr>
<tr>
<td>Readmissions, n (%)</td>
<td>10 (11.1)</td>
<td>11 (8.2)</td>
<td>NS</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>0.04</td>
</tr>
</tbody>
</table>

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

*Student t test.

*χ² test.

Of the patients from the MMRH group who were readmitted, 2 required re-operation (covered eversion 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.20

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.9 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 percentage of readmissions. In some studies, very short learning curve and will improve with an increase in the time did not have experience.9 In this respect, we believe that hospital stays that were significantly shorter than those who had experience in multimodal rehabilitation achieved

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