Original Article

The effects of multi-disciplinary teamwork on pain relief and infection prevention in hip replacement

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Received October 15, 2019; Accepted November 20, 2019; Epub March 15, 2020; Published March 30, 2020

Abstract: Objective: This study was designed to evaluate the pain relief and infection prevention effects of multi-disciplinary teamwork (MDT) in hip replacement. Methods: 107 senior patients who underwent hip replacement in our hospital from August 2015 to February 2018 were included in this retrospective analysis. They were, according to the intervention modes, divided into a control group for routine orthopedic nursing and an observation group for intervention via multi-disciplinary teamwork on the basis of the services provided to the control group. The two groups were compared in terms of their scores on the Harris hip, visual analogue scale (VAS), their quality of life (QOL), and in terms of the postoperative occurrence of infections at the incisional wounds at various stages. Results: (1) Compared with the control group, the observation group yielded higher Harris hip scores at 1 month, 3 months, and 6 months after surgery ($P<0.05$); (2) The 1-month, 3-month, and 6-month VAS scores of the observation group after the operations were (5.16±0.22), (3.25±0.12), and (1.12±0.08), scores lower than the control group’s score, which were (6.25±0.98), (4.58±0.56), and (2.88±0.16) ($t=7.972$, $16.912$, $72.167$, $P<0.05$); (3) The observation group reported 2 cases of postoperative infections of the incisional wounds, an incidence rate of 3.70%, but in the control group, 13 such cases were observed, an incidence rate of 24.54% ($P<0.05$); (4) The patients in the observation group gave higher scores to QOL at 1 month, 3 months, and 6 months after their operations compared with the observation group ($P<0.05$). Conclusion: Multi-disciplinary teamwork is an effective solution for relieving the intense pain patients suffer after hip replacement, and it prevents infection and improves the patients’ QOL.

Keywords: Multi-disciplinary teamwork, hip replacement, infection prevention, pain, hip function

Introduction

Artificial hip replacement is a routine clinical solution to hip joint diseases such as joint malformation, limitation of motion (LOM), and pain [1, 2]. Studies show that more than 500,000 patients receive a hip replacement annually [3].

Currently, in the wake of accelerated aging in China, the number of senior patients with hip diseases has increased considerably [4]. For such a population, surgical treatment aims to relieve them from pain, further their functional recovery, and bring improvements to their QOL [5, 6]. In general, patients with hip replacement are older, have more underlying diseases, have a higher incidence of complications, and have a slower recovery of the joint muscles. Conventional nursing models have had difficulty in satisfying patients’ nursing and rehabilitation needs. This requires MDT to intervene and propose targeted solutions based on the patients’ specific problems [7, 8]. MDT is a new nursing mode applied extensively in clinical nursing [9]. The nursing model mainly focuses on a certain disease, builds a professional MDT, promotes collaboration, and finally formulates a targeted and standardized comprehensive treatment program, so as to optimize the diagnosis and treatment effects of patients to the greatest extent. For patients requiring hip replacement, an MDT mode shall be established for them during their stays in the hospital as a guarantee of successful operations and an effective promoter of postoperative recovery [10, 11]. Therefore, the present study explored the pain relief and infection prevention effects of multi-disciplinary teamwork in hip replacement.

To specifically analyze the application effects of MDT in hip replacement, the present study
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included a control group for routine nursing and an observation group for intervention via MDT to boost the recovery of patients after hip replacement and to improve their QOL.

Materials and methods

Materials

107 senior patients who underwent hip replacement in our hospital from August 2015 to February 2018 were included, retrospectively analyzed, and divided into 2 groups based on the intervention modes. The control group (n=53), which included 33 males and 20 females ranging in age from 62 to 78, was routinely nursed, while the observation group (n=54), which included 35 males and 19 females ranging in age from 61 to 77, was intervened with MDT. Inclusion criteria: Informed consent was obtained; patients who were consistent with the indications for hip replacement and who had clear consciousness were included. The study was approved by the ethics committee of the Tangshan People's Hospital. Exclusion criteria: some patients were excluded because they had a previous history of ipsilateral hip joint repair or infection, concurrent malignant tumors, metal disorders, cognitive disorders, or pathological fractures.

Methods

The patients in both groups underwent the same operation, anticoagulation and analgesia, and standard infection prevention modes were applied. The intervention lasted 6 months.

The controls were routinely nursed, including a comprehensive evaluation of the patients’ history of drug use, basic diseases, course of the disease and general information, based on which, a targeted recovery plan was established, and the patients were guided in doing postoperative exercises to promote postoperative recovery; upon discharge, a recovery manual was distributed to each of them, indicating the contents of the postoperative recovery exercises and notes. To record their recovery progress, follow-ups by phone calls were arranged, and questions from patients and their family members were answered patiently. In addition, consulting services and targeted guides were also offered, and the patients were ordered to make return visits at 1 month, 3 months, and 6 months after the operation. The observations were intervened with MDT.

Establishment of a dedicated MDT team

A dedicated MDT team was structured according to the actual characteristics of the senior patients for hip replacement, which consisted of 2 primary nurses, 2 doctors in charge of orthopedics, family supervisors, professional rehabilitation therapists and doctors of internal medicine.

Preoperative interventions

After admission, the patients were comprehensively assessed for any history of drug use, basic diseases, the course of the disease, physiological and general conditions, and categorized for surgical risks according to the scoring criteria of the American Association of Anesthesiologists (ASA). For patients indicating a low risk, the operation was performed at a selected date, and for patients with a high risk, doctors of internal medicine were invited for a joint consultation and the operations were arranged as the patients stabilized, before which, the possible risks during the operation were communicated to the patients and their family members; the primary nurses evaluated the patients using an evaluation form describing 4 preventive measures, and they formulated a personalized nursing intervention plan according to existing nursing problems and high-risk factors. Meanwhile, the preoperative health education was enhanced, including an introduction to the surgical process and the notes therein; the doctors in charge performed special examinations of the patients and recorded any complications such as cerebral infarction, respiratory diseases, diabetes mellitus, arthritis deformans, hypertension and cardiogenic diseases. Before the joint consultation, the patients’ medical records were reported in detail to help the team members understand their basic conditions, who, after discussion, presented their suggestions for the treatment from their disciplinary perspectives, while the primary nurses formulated targeted nursing intervention plans based on the joint consultation results with assistance from the head nurse. The nursing plan was implemented by the family supervisor and the primary nurses and covered aspects such as pain nursing, basic nursing, postoperative functional exercise, psychological intervention, prevention and the treatment of complications, etc.
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Postoperative intervention measures until discharge of the patients

(1) Postoperative guidance required the patients to take targeted functional exercises with assistance from the primary nurses, professional rehabilitation therapists, and the doctors in charge based on their understanding of the patients’ conditions. Auxiliary rehabilitation tools were reasonably applied and recorded; the patients were required to comply with the principle of progression during the postoperative functional exercises to effectively promote the recovery of muscle strength and hip joint functions, and to avoid the formation of deep venous thrombosis (DVT) in the lower extremities. (2) Using the principle of WHO’s three-step analgesic ladder, the patients were intensively treated and received pain intervention in a targeted manner according to their VAS scores. (3) The primary nurses actively and positively communicated with the patients, comprehensively evaluated their psychological statuses and provided them with emotional assistance to rebuild confidence in recovery. (4) The patients’ major caregivers with an educational background above primary school, were designated as the family supervisor to live and get connected with the patients, and to encourage them to do their functional exercises. Primary nurses were required to enhance the health education and functional exercise training for the patients and their family supervisors, including guidance on daily activities, functional exercises, postures as well as the times of return visits. The patients’ information was registered before discharge in their charts.

Follow-up upon discharge

Upon discharge, the primary nurses arranged to follow up with the patients via phone calls at a frequency of once every 2 weeks in the first month, and once per month from the 2nd to the 6th months, to learn about and record in detail their possible conditions, including loose prostheses, infections of the incisional wound, swelling and pain, joint functions and muscle recovery, etc. Each phone call was controlled to last between 15 and 20 min and aimed to consolidate the undesired intervention effects from the previous phone call and urged patients to keep their regular examination appointments. A WeChat group was established to facilitate communication and exchange with the patients and to collect their feedback.

Observation indices

(1) Harris hip score: The Harris Hip Score was used to evaluate the hip joint functions of both groups in the 1st, 3rd and 6th months, which included 4 dimensions, namely, movement range of the hip joint (5 points), malformation of the lower extremities (4 points), gait and activities (47 points), and pain (44 points). The scores are calculated as 90-100 for excellent results, 80-89 being good, 70-79 fair, and below 69 a failed result [12, 13]. The scale is assigned with a Cronbach’s α of 0.91.

(2) Visual analogue scale (VAS): The VAS Scale was used to evaluate the pain intensity of both groups at 1 month, 3 months, and 6 months after the operation. Pain intensity is represented by 11 numbers from 0 to 10, and the score is reported as 0 for no pain and 10 for the worst possible pain, and the higher the score, the more severe the pain [14, 15]. The scale is assigned with a Cronbach’s α of 0.89.

(3) Occurrence of infection of the incisional wound: The 2 groups were compared for the occurrence of infections of the incisional wound.

(4) QOL score: The SF-36 Scale was used to assess the QOL of both groups at 1 month, 3 months, and 6 months after the operations. The scale consists of 36 items covering 8 dimensions, and its score is the average of the 8 dimensions after standardization [16, 17]. The scale is assigned with a Cronbach’s α of 0.92.

Statistical analysis

The statistical analysis was performed using SPSS 22.0. In case of numerical data expressed as the means ± standard deviations, comparison studies were carried out through independent-samples t tests for the data which were normally distributed, and a Mann-Whitney U test for the data which were not normally distributed, paired tests for pre-and-pro comparison in the group; in the case of nominal data expressed as [n (%)], comparison studies were carried out through X² tests for the intergroup comparisons. For all statistical comparisons, significance was defined as P<0.05.
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Results

Comparison of the observation and control groups in terms of general characteristics

The observation group consisted of 35 males (64.81%) and 19 females (35.19%) with an age range of 61-77 and average age of (72.15±1.09), while the control group comprised 33 males (62.26%) and 20 females (73.74%) with an age range of 62-78 and average age of (72.06±1.08). The observation group reported 28 (51.85%) cases of fracture in the left lower extremity and 26 (48.15%) in the right lower extremity; 22 (40.74%) cases of transcervical fracture, and 32 (59.26%) of intertrochanteric fracture, 12 (22.22%) cases of concurrent cardiogenic disease, 8 (14.81%) cases of hypertension, 9 (16.67%) cases of arthritis deformans, 5 (9.26%) cases of diabetes mellitus, and 6 (11.11%) cases of cerebral infarction, which corresponded to 29 (54.72%), 24 (45.28%), 21 (39.62%), 32 (60.38%), 13 (24.53%), 6 (11.32%), 8 (15.09%), 6 (11.32%), and 5 (9.43%) in the control group. The two groups had no statistical difference in terms of gender, average age, fracture site, fracture type (Figure 1), or complications (Figure 2) (P>0.05, Table 1).

Comparison of the observation and control groups in terms of their Harris hip scores

Compared with the control group, the observation group yielded higher Harris hip scores at 1 month, 3 months, and 6 months after the surgery (P<0.05, Table 2).

Comparison of the observation and control groups in their VAS scores

The 1-month, 3-month, and 6-month VAS scores of the observation group after the operations were (5.16±0.22), (3.25±0.12), and (1.12±0.08) accordingly, which were lower than the scores in the control group of (6.25±0.98), (4.58±0.56) and (2.88±0.16) (t=7.972, 16.912, 72.167, P<0.05) (Figure 3).

Comparison of the observation and the control groups in terms of postoperative infections of the incisional wound

The observation group reported 2 cases of postoperative infections of the incisional wound with an incidence rate of 3.70%, while in the control group, 13 such cases were observed, with an incidence rate of 24.54% (P<0.05, Table 3).

Comparison of the observation and control groups in terms of postoperative QOL

The patients in the observation group gave higher QOL scores at 1 month, 3 months, and 6

Figure 1. Comparison of fracture type between the observation and control groups. Transcervical fracture and intertrochanteric fractures accounted for 40.74% and 59.26% in the observation group and 39.62% and 60.38% in the control group (P>0.05).

Figure 2. Comparison of the complications in the observation and control groups. Patients with cardiogenic disease, hypertension, arthritis deformans, diabetes mellitus and cerebral infarction accounted for 22.22%, 14.81%, 16.67%, 9.26%, and 11.11% in the observation group and 24.53%, 11.32%, 15.09%, 11.32% and 9.43% in the control group (P>0.05).
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Table 1. Comparison of the general characteristics between the observation group and control group [n(%)]/(X±s)

<table>
<thead>
<tr>
<th>Materials</th>
<th>Observation Group (n=54)</th>
<th>Control Group (n=53)</th>
<th>t/χ²</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gender (n) M</td>
<td>35 (64.81)</td>
<td>33 (62.26)</td>
<td>0.075</td>
<td>0.784</td>
</tr>
<tr>
<td>F</td>
<td>19 (35.19)</td>
<td>20 (73.74)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Age (y)</td>
<td>72.15±1.09</td>
<td>72.06±1.08</td>
<td>0.429</td>
<td>0.669</td>
</tr>
<tr>
<td>Fracture site</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Left lower extremity</td>
<td>28 (51.85)</td>
<td>29 (54.72)</td>
<td>0.088</td>
<td>0.766</td>
</tr>
<tr>
<td>Right lower extremity</td>
<td>26 (48.15)</td>
<td>24 (45.28)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fracture type</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Transcervical fracture</td>
<td>22 (40.74)</td>
<td>21 (39.62)</td>
<td>0.351</td>
<td>0.906</td>
</tr>
<tr>
<td>Intertrochanteric fracture</td>
<td>32 (59.26)</td>
<td>32 (60.38)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Complications</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cardiogenic disease</td>
<td>12 (22.22)</td>
<td>13 (24.53)</td>
<td>0.152</td>
<td>0.998</td>
</tr>
<tr>
<td>Hypertension</td>
<td>8 (14.81)</td>
<td>6 (11.32)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Arthritis deformans</td>
<td>9 (16.67)</td>
<td>8 (15.09)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Diabetes mellitus</td>
<td>5 (9.26)</td>
<td>6 (11.32)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cerebral infarction</td>
<td>6 (11.11)</td>
<td>5 (9.43)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 2. Comparison of the Harris Hip Scores between the observation and control groups (X±s, point)

<table>
<thead>
<tr>
<th>Group</th>
<th>1 Month after Operation</th>
<th>3 Months after Operation</th>
<th>6 Months after Operation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control Group (n=53)</td>
<td>60.12±0.15</td>
<td>72.56±5.26</td>
<td>85.12±3.26</td>
</tr>
<tr>
<td>Observation Group (n=54)</td>
<td>72.52±0.98</td>
<td>81.69±5.69</td>
<td>91.58±3.88</td>
</tr>
<tr>
<td>t</td>
<td>38.334</td>
<td>8.615</td>
<td>9.316</td>
</tr>
<tr>
<td>P</td>
<td>0.000</td>
<td>0.000</td>
<td>0.000</td>
</tr>
</tbody>
</table>

Figure 3. Comparison of the VAS Scores at the various postoperative stages between the observation and control groups. The observation group was lower than the control group in terms of VAS scores at 1 month, 3 months, and 6 months after the operation (P<0.05). *indicates P<0.05 when compared with the control group.

Discussion

Artificial hip replacement is a general solution to hip diseases, during which, high vigilance is necessary in addition to sophisticated operating skills and nursing requirements [18, 19], as its targets are mostly the senior population who suffer from many basic diseases at the same time. In the past, patients were intervened with the routine nursing mode clinically, which is simple and therefore difficult to satisfy some patients’ demands on nursing, since nurses are the main providers of such services [20].

MDT is a frequently applied medical mode in recent years which involves working around a disease as a professional multi-disciplinary team in which members assist each other to formulate targeted, regulated, and comprehensive treatment plans, to maximally optimize the treatment effects of patients [21, 22]. Patients with artificial hip replacement have higher demands in postoperative recovery. For such patients, professionals establish targeted recovery plans to relieve pain and improve hip joint functions [23, 24], and in such a process, cooperation from various disciplines is necessary, including nursing, recovery and orthopedics for functional recovery, psychological counseling and pain control as a senior patient demanding artificial hip replacement is engaged in complicated conditions and demands an extensive recovery scope in the early stages [25].

To various degrees, senior patients demanding artificial hip replacement have problems such as an abnormal gait, limited movement, muscle atrophy, and lower extremity imbalance, due to which, postoperative recovery in the early stages becomes a major means to promote the recovery of muscle strength and hip joint func-
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Table 3. Comparison of the postoperative infections of the incisional wounds between the observation and control groups [n (%)]

<table>
<thead>
<tr>
<th>Group</th>
<th>n</th>
<th>Incidence of Postoperative Infection of Incisional Wound</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control Group</td>
<td>53</td>
<td>13 (24.54)</td>
</tr>
<tr>
<td>Observation Group</td>
<td>54</td>
<td>2 (3.70)</td>
</tr>
</tbody>
</table>

\(X^2 = 9.623\)

\(P = 0.002\)

Table 4. Comparison of QOL between the observation and control groups (\(\bar{X} \pm s\), Point)

<table>
<thead>
<tr>
<th>Group</th>
<th>1 Month after Operation</th>
<th>3 Months after Operation</th>
<th>6 Months after Operation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control Group (n=53)</td>
<td>53.12±2.52</td>
<td>62.15±2.69</td>
<td>84.16±3.22</td>
</tr>
<tr>
<td>Observation Group (n=54)</td>
<td>61.19±2.49</td>
<td>72.28±3.28</td>
<td>93.28±4.15</td>
</tr>
</tbody>
</table>

\(T = 16.662\)

\(P = 0.000\)

In conclusion, MDT is an effective solution to relieve the pain intensity patients suffer from after hip replacement and to prevent infection and improve their QOL.
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Limitation analysis: affected by factors such as limited sample size, the study results may not be representative. Therefore, a future study with a larger sample size should be carried out in the future.

Acknowledgements

Scientific and Technological Achievements of Hebei Province: The application of dexmedetomidine and remifentanil combined with acupuncture anesthesia in orthopedic surgery, 20180923.

Disclosure of conflict of interest

None.

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