

Study of pain level control targets after arthroscopic surgery

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Abstract

Objective: To explore the goal of pain control in patients after arthroscopic surgery.

Design: Investigation. Postoperative pain, pain control satisfaction and the effect of pain on daily activities were investigated and evaluated.

Setting: Department of Sports Medicine, Peking University 3rd Hospital, Beijing, P.R. China

Subjects: 514 patients selected by convenience sampling from patients hospitalized in a level A hospital in Beijing from 2020.06-2020.11. The patient inclusion criteria were an age of at least 18 years, a lack of significant personality disorders, stable social and psychological factors, the ability to clearly express his or her pain and an agreement to voluntarily cooperate with the investigators. The exclusion criteria were patients who had been using painkillers long-term and those with other acute and chronic pain disorders.

Methods: Postoperative pain, pain control satisfaction and the effect of pain on daily activities were investigated and evaluated by administering a homemade questionnaire to 514 patients selected by convenience sampling from patients hospitalized in a level A hospital in Beijing from 2020.06-2020.11. Pain was assessed using a digital pain numerical rating scale (NRS) (0-10), and a digital score ranging from 0 to 10 was used for satisfaction with pain control and the impact of pain on aspects of daily living.

Results: The pain level was most severe in patients 6-24 hours after arthroscopic surgery, during which pain control satisfaction was at its worst. The pain score was significantly related to the effects of pain on aspects of daily life, and the degree of these effects changed significantly for pain scores greater than 2 points.

Conclusion: Pain control 6 to 24 hours after surgery is not satisfactory. It is recommended that a pain score of 2 points is used as the goal for pain control after arthroscopic surgery to guide both doctors and patients to effectively control postoperative pain.

1 Introduction

In 2001, International Association for the Study of Pain defined pain as an unpleasant, emotionally subjective feeling consisting of a combination of physical and psychological factors accompanied by existing and potential tissue damage.

In clinical work, pain has been receiving increasing attention and is now considered the 5th vital sign along with body temperature, pulse, respiratory rate and blood pressure. The U.S. Guidelines for Practice on Acute Pain during the perioperative period clearly state that [1] consideration should be given to determining the level of pain that requires pain relief or intervention as well as the goal of pain level management. In recent years, some scholars [2, 3] have proposed limiting the level of noncancer pain to less than 4 points on the pain score; that is, according to these studies, a score of 4 points should be the threshold that distinguishes mild and moderate pain. Similarly, Boonstra's study of chronic musculoskeletal pain indicated that [4] ≤ 5 points on the pain scale should be considered mild pain, 6–7 moderate pain, and 8 or more severe pain, suggesting that pain intervention should be provided for a score of 5. Guo et al. [5] also suggested that the goal of pain control after general surgery should be a score of ≤ 4 points, and Gerbershagen et al. [6] research suggested that a score of 4 points should be considered a critical threshold of postoperative acute pain, while pain with a score of 2 could affect mood, sleep, and activity. Several small studies have led many clinicians to believe that when the pain score is 4 or more, they need to increase the dose of painkillers, change the type of medication, or implement other interventions [7, 8]. However, some studies have noted that the pain management target score should be set at 2 points, indicating that pain scoring 3 or more points should be treated accordingly. Although the standards for postoperative pain control have not yet been harmonized across various countries, a number of studies from China and other countries have shown that [1, 9–11] postoperative pain control remains unideal and that if postoperative pain is not effectively controlled, it will seriously affect the patient's prognosis and satisfaction.

The benefits of arthroscopic surgery over traditional open surgery include minimal surgical trauma and tissue damage and rapid patient recovery, but postoperative pain control following arthroscopic surgery remains unsatisfactory [12]. Pain should be controlled after arthroscopic surgery to a level that will both be acceptable to the patient and not affect their physiological function and postoperative rehabilitation. This philosophy is directly related to the quality of postoperative pain control and patient satisfaction and can help Chinese and foreign scholars, medical personnel, and pharmaceutical industries develop effective drugs and methods that can substantially guide pain control. Therefore, the purpose of this project is to establish a goal for pain control after arthroscopic surgery, to prepare for the further development of arthroscopic pain control guidelines and standards and to fill the gaps in this field for future reference.

2 Objects And Methods

2.1 Object

Convenience sampling was used to recruit 514 patients admitted to the arthroscopic surgery department of a third-level sports medicine hospital in Beijing for pain-related assessment and investigation from 2020.06 to 2020.11. The patient inclusion criteria were an age of at least 18 years, a lack of significant personality disorders, stable social and psychological factors, the ability to clearly express his or her pain and an agreement to voluntarily cooperate with the investigators. The exclusion criteria were patients who had been using painkillers long-term and those with other acute and chronic pain disorders.

2.2 Method

2.2.1 Questionnaire design

Through a literature review, the Practice Guidelines on Acute Pain in the Perioperative Setting, developed by the American Association of Anesthesiologists (ASA) in conjunction with the American Pain Association (APS) [1], the commonly used McGill Pain Questionnaire (MPQ), and the Houston Pain Questionnaire were selected in this study to assess patient pain control goals.

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The expert meeting finally determined the contents of the questionnaire, which consisted of three parts: (1) general demographic information and preoperative and past pain conditions: age, sex, marital status, education, number of previous operations, site of the operation, surgical anaesthesia, expected value of the most severe postoperative pain, satisfaction with the postoperative pain control, and the most severe past pain score; (2) postoperative pain: 9 items including the site of pain, pain score at 6 different postoperative time periods (immediately and 6, 9, 12, 24, and 48 hours after surgery) and patient satisfaction; and (3) effects of postoperative pain on daily life, including 10 items: pain associated with lying in bed (turning over, transition between lying down and sitting up), dressing, eating/drinking water, getting into and out of bed, toilet, walking, sleep, mood, relationships with others, and rehabilitation exercise.

Both the validity and confidence of the questionnaire were tested as follows: (1) validity: the contents of the questionnaire were assessed by 7 experts engaged in nursing management, surgical care, sports trauma and anaesthesia, which yielded a content validity of 0.94; (2) Consistency: the second (postoperative pain) and third parts (the effect of postoperative pain on daily life) of the questionnaire were tested for internal consistency with Cronbach's alpha, yielding values of 0.73 and 0.94, respectively, both of which indicated good confidence in the questionnaire.

2.2.2 Survey tool

A digital pain numeric rating scale (NRS) (0–10) was used to score the pain, where 0 means no pain and 10 means the most severe pain imaginable. Satisfaction with pain control was assessed by a numerical score from 0 to 10, with 0 meaning very dissatisfied and 10 very satisfied. The influence of pain on daily life was assessed by a score from 0 to 10, with 0 indicating that daily life was unaffected and 10 indicating that it was completely affected.

2.2.3 Investigator training and timing

The caregivers involved in the study were trained in the use of the NRS pain scores, satisfaction with pain control, and the degree of the impact of pain on daily life. Additionally, they were taught how to unify guidance and communication terms, explain the purpose, significance and methods of the investigation, and obtain patient cooperation.

The questionnaire was evaluated and completed by nurses when they returned to the patient ward immediately after surgery and 6, 9, 12, 24 and 48 hours after surgery to assess the patient's pain level score, satisfaction with pain control, and the impact of pain on daily activities. A total of 514 questionnaires were completed validly for an effective recovery rate of 100%.

2.2.4 Pain control regimen

This study follows the principle of cancer pain score management in guiding the postoperative administration of painkillers, i.e., they should be administered for scores of at least 4 points. In other words, the postoperative pain level score, satisfaction with pain control, the impact of pain on daily life, etc., in this study are the result of the pain control guidelines derived from this standard.

2.3 Statistical processing

SPSS 21.0 statistical software was used for data analysis. First, the Kolmogorov-Smirnov and homogeneity of variance tests were performed. Measurement data satisfying a normal distribution and homogeneity of variance are expressed as $X \pm s$ and were statistically analysed with the t-test. Measurement data that did not satisfy a normal distribution or homogeneity of variance are expressed as the median and were statistically analysed using the non-parametric Mann-Whitney U test. The Kendall correlation coefficient was used in the correlation study. The non-parametric Mann-Whitney U test was used to calculate the test statistics and their corresponding P values. $P < 0.05$ was considered statistically significant.

3 Results

3.1 General information

Of the 514 included patients, 308 were male and 206 were female, aged 18–69 years, with an average age of 31.82 ± 13.56 years. Thirty-two patients underwent shoulder arthroscopic surgery, 32 underwent hip arthroscopic surgery, 334 underwent knee arthroscopic surgery, and 116 underwent ankle arthroscopic surgery. General anaesthesia was administered to 95 patients and joint epidural and spinal anaesthesia to 419 patients. The patients reported a severe pain score of 6.63 ± 2.36 points, expected postoperative pain to be controlled below 3.65 ± 2.03 points, and had an average postoperative pain control satisfaction score of 7.93 ± 2.20 .

3.2 Analytical results for postoperative pain status

Postoperative pain was the most severe from 6 to 24 hours, higher than the average after surgery (4.26 ± 1.89), while the patients expected postoperative pain to be controlled at a score of 3.65 ± 2.03 , suggesting that 6–24 hours after surgery, the patients were not satisfied with their pain control (Fig. 1).

3.3 Correlation analysis between pain score and pain control satisfaction score at different time periods

Immediately and 6, 9, 12, 24 and 48 hours after surgery, the pain score was negatively correlated with satisfaction; that is, as the pain score increased, satisfaction with pain control decreased. Except immediately and 48 hours after the operation, when the satisfaction score was higher than the average level of satisfaction (7.93 ± 2.20), the score for the satisfaction with pain control 6–24 hours after the operation was lower than average, suggesting that the pain control 6–24 hours after the operation was relatively unsatisfactory (Table 1).

Table 1
Correlation between pain control satisfaction score and pain score over time

Time period	Pain score	Satisfaction score	Correlation coefficient (r)	P value
Immediately after surgery	2.53 ± 2.90	8.41 ± 2.60	-0.255	< 0.01
6 hours after surgery	5.00 ± 2.44	7.84 ± 2.54	-0.203	< 0.01
9 hours after surgery	5.86 ± 2.33	7.79 ± 2.47	-0.247	< 0.01
12 hours after surgery	4.79 ± 2.40	7.82 ± 2.47	-0.247	< 0.01
24 hours after surgery	4.31 ± 2.29	7.62 ± 2.75	-0.240	< 0.01
48 hours after surgery	3.43 ± 2.33	7.96 ± 2.86	-0.194	< 0.01

3.4 Different pain scores affect various factors in daily life

The cumulative pain score across all tracked time periods (immediately and 6, 9, 12, 24, and 48 hours after surgery) was 3081. Furthermore, the pain score was analysed to determine the effects of pain on activity, undressing, eating/drinking water, getting into/out of bed, using the toilet, walking, sleep, mood, relationship with others, rehabilitation exercise, and satisfaction. The results are as follows.

Correlations were calculated between the overall pain score and the influence of pain on various aspects of daily life; in addition to being negatively correlated with the effect of satisfaction, the pain score was positively correlated with the degree of influence on other daily life aspects ($P < 0.001$), i.e., the degree of impact on each aspect of daily life increased with increasing pain score (Table 2).

Table 2
Correlation between pain score and the degree of influence on aspects of daily life

Aspect	Correlation coefficient (r)	P value
Activity	0.509	0.001
Undressing	0.438	0.001
Eating/drinking water	0.313	0.001
Getting into and out of bed.	0.450	0.001
Toilet use	0.414	0.001
Walking	0.460	0.001
Sleep	0.550	0.001
Mood	0.481	0.001
Relationships with others	0.362	0.001
Rehabilitation exercise	0.419	0.001
Pain control satisfaction	-0.242	0.001

The effects of different pain scores on daily factors were compared in pairs, as shown in Table 3. A pain score of ≤ 2 points does not seem to have an obvious influence on the daily aspects, but when the score increases from 2 to 3 points, a significant influence can be observed on many of the daily aspects.

Table 3
Comparing the impact between pairs of pain scores on each daily aspect (P values shown)

Pairs	Activities	Undressing	Eating/drinking water	Getting in and out of bed	Using the toilet	Walking	Sleep	Mood	Relationships with others	Rehabilitation exercise
0 vs. 1	0.967	0.813	0.333	0.896	0.914	0.813	0.586	0.818	0.395	0.763
1 vs. 2	0.022	0.138	0.718	0.207	0.514	0.217	0.038	0.136	0.162	0.176
2 vs. 3	0.003	0.007	0.006	0.000	0.000	0.000	0.000	0.000	0.075	0.000
3 vs. 4	0.607	0.603	0.518	0.461	0.441	0.025	0.077	0.492	0.465	0.874
4 vs. 5	0.000	0.000	0.001	0.000	0.006	0.009	0.001	0.019	0.088	0.114
5 vs. 6	0.000	0.001	0.019	0.000	0.004	0.000	0.000	0.000	0.004	0.002
6 vs. 7	0.000	0.005	0.166	0.072	0.011	0.061	0.017	0.005	0.126	0.000
7 vs. 8	0.007	0.077	0.026	0.210	0.665	0.047	0.032	0.374	0.047	0.126
8 vs. 9	0.971	0.268	0.425	0.006	0.017	0.165	0.001	0.008	0.994	0.174
9 vs. 10	0.166	0.034	0.104	0.075	0.631	0.159	0.186	0.005	0.000	0.002

The change curve of the various factors affected by the pain score is shown in Fig. 2. The higher the pain score is, the greater the effect of pain on daily life. When the pain score is 2–3, the pain curve of the influence of each daily factor changes greatly, showing a clear upward trend.

4 Discussion

4.1 Analysis of pain and satisfaction degrees after arthroscopy

As shown in Table 1, the pain degree of the patients was the most severe 6 to 24 hours after surgery, reached a peak of 5.86 ± 2.33 points 9 hours after surgery, and gradually decreased over time. The table shows that the average pain level of the patients after arthroscopy was between moderate and severe. Table 2 indicates that the pain control 6–24 hours after surgery was relatively unsatisfactory, neither meeting the expectation of patients nor reaching the average level of satisfactory control. Although the pain did not reach the most severe level at its peak, pain control did not meet patient expectations, indicating that it was not satisfactory and that postoperative pain management was inadequate. Therefore, pain control requires further improvement, consistent with the results reported in the literature [1, 9–11]. The reason for the dissatisfaction with pain control may be related to the administration of analgesic medication after the operation, which in this study was guided by the principle of cancer pain degree score management, that is, that analgesic drugs be given at or above 4 points. In 1986, the World Health Organization (WHO) proposed criteria for the control of cancerous pain, namely, the requirement for pain-free sleep at night, rest during the day, activity during the day and work. This is a relatively clear and perfect goal. Cancerous pain is considered chronic pain, while postoperative pain is a kind of acute pain. The American Association of Anaesthesiologists defines postoperative pain as the painful experience caused by the operation itself or related complications [13]. In contrast to cancer pain, postoperative pain is a complex physiological and psychological response of the human body to the process of tissue damage and repair. The two have great differences in their influences on the patients' physiological, psychological and stress levels, etc. Therefore, they are not the same with regard to the goal of pain degree control. Table 3 indicates that as the pain score increases, the degree of influence on daily aspects increases while the influence on satisfaction decreases, which further suggests that the quality of life and satisfaction of patients can be improved by reducing the degree of pain. This result is consistent with the research results of Lin et al. [14]. In summary, it is suggested that the target value of pain control be reasonably set after arthroscopy and that, specifically, pain management be strengthened 6–24 hours after surgery to improve the patients' quality of life and satisfaction with pain control.

4.2 Recommendations for pain control goals after arthroscopic surgery

As shown in Table 3, the impact of pain on bed-related activities (turning over, transitioning from lying down to sitting, getting into and out of bed), undressing, eating/drinking water, using the toilet, walking, sleep, mood, relationships with others and rehabilitation exercise are positively correlated with pain scores; that is, the higher the pain score, the greater the impact on the above daily aspects is. Additionally, a lower satisfaction with pain control was associated with a higher pain score Fig. 2 shows that the effect of pain scores ≤ 2 on daily aspects is not obvious; however, a significant influence can be observed for pain scores > 2 points. Additionally, there is a clear upward trend in the effect of pain score on daily aspects, as shown in Fig. 1. These results are consistent with the findings of Salaudeen et al. [7] and Roy et al. [8]. In summary, the present study suggests a pain score of 2 points as the goal for pain control after arthroscopic surgery; that is, when the pain score after surgery is at least 2 points, positive treatment should be administered to the patient to control the post-arthroscopy pain level to at most a score of 2 points. In addition, between 6 and 24 hours after surgery, non-drug treatment methods [15], such as effective communication, diverting attention, listening to soothing music, virtual reality (VR) technology [16], and psychological guidance, can be used as an effective supplement to drug analgesia. At the same time, advance analgesia techniques, including multi-mode analgesia, intravenous, epidural and nerve block pain pumps and other anti-pain measures for pain control after arthroscopic surgery have played a positive role in promoting recovery. The establishment of a pain control target after arthroscopic surgery will further improve the quality of pain management during the perioperative period as well as the postoperative quality of life and satisfaction of the patients.

5 Conclusion

Unsatisfactory pain control is reported by patients 6 to 24 hours after arthroscopic surgery. This study therefore recommends a pain score of 2 points as the goal of pain control after arthroscopic surgery to guide both doctors and patients to effectively control postoperative pain and improve the quality of life and satisfaction of arthroscopic surgery patients.

Declarations

Conflicts of interest

The authors have no conflicts of interest to declare.

Human Ethics

1.Ethical Approval statement: Ethical Approval was obtained from Peking University Third Hospital Medical Science Research Ethics Committee for this study.

2.Guidelines/Accordance statement All methods were performed in accordance with the relevant guidelines and regulations.

3.Informed Consent: Informed consent was obtained from all participants for this study.

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Availability of data and materials

All data generated or analysed during this study are included in this published article.

Authors' contributions

WJQ contributed to the conception of the study; WX and LCY contributed significantly to analysis and manuscript preparation, and wrote the main manuscript text;ZXI and WH contributed to the data collection;XY and LBH participated in the coordination of the study and reviewed the manuscript.

Publication

Not applicable.

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Tables

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Table 3. Comparing the impact between pairs of pain scores on each daily aspect (P values shown)

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Figures

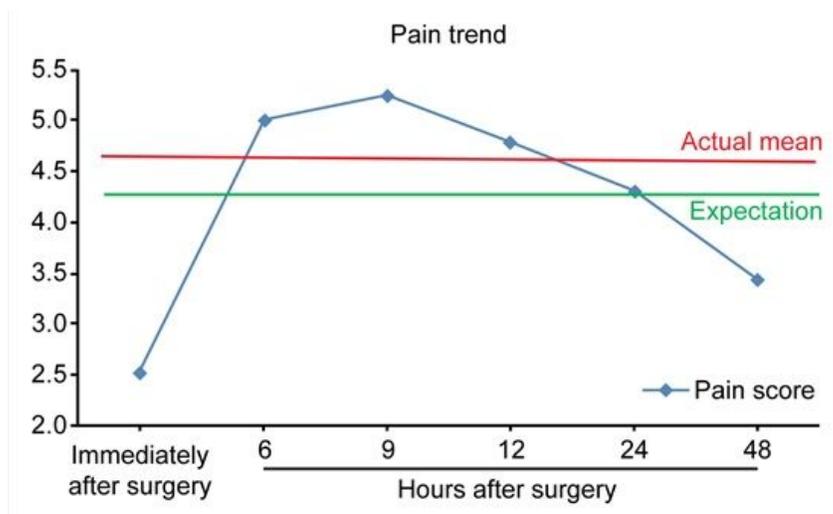


Figure 1

Postoperative pain score over time

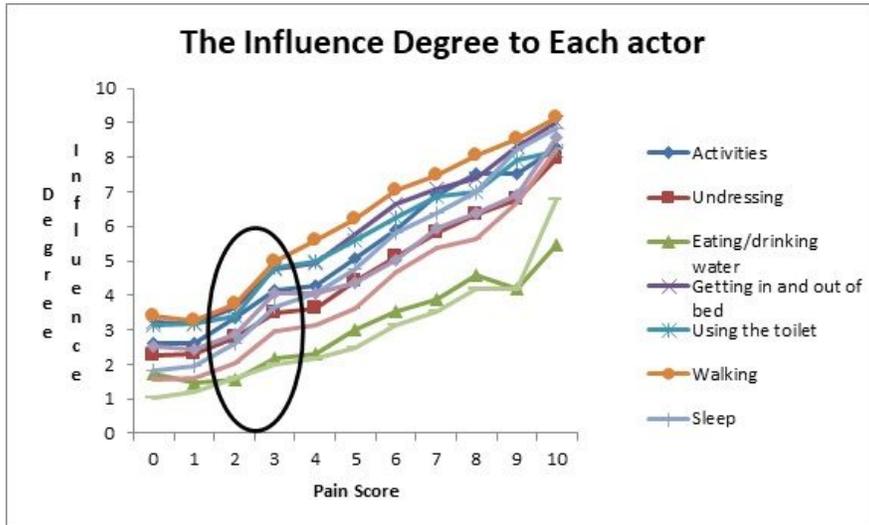


Figure 2

Influence degree to each actor