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Multimodal Pain Management and Subacromial Analgesia in the Perioperative Period of Patients with Rotator Cuff Injury

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Abstract: Rotator cuff injury is a high incidence disease in our daily life. Its causes are complex and its mechanism is not clear. It is one of the most common musculoskeletal diseases in clinic. For serious rotator cuff injury, the main treatment is arthroscopic surgery. At present, this kind of surgery is more mature at home and abroad, but postoperative pain management is one of the difficulties of surgical rehabilitation. There are few studies on postoperative pain management at home and abroad. To solve this problem, this paper will further study the application of multimodal pain management scheme and subacromial analgesia in the perioperative period of patients with rotator cuff injury. In order to better analyze the effect of multimodal pain management, this paper established the corresponding experimental model. All the samples were from real cases, and 44 volunteers met the requirements through screening. The experimental samples were randomly divided into two groups, the traditional analgesia group, the main method was oral NSAIDs, the other group was multimodal pain management group, using a combination of 0.15% ropivacaine + sufentanil 50ug 100ml. During this period, four comparative experiments including UCLA score, VAS score and postoperative complications were carried out. Through the experimental data, this paper analyzes that the two groups of different analgesic management programs can have an effect on postoperative rehabilitation, in the short term after the operation, the two groups of data difference is not big, but in the middle and later period, the multi-mode management program shows obvious advantages. In many scores, it was prior to the traditional group, and the effect of controlling complications was significant. In this paper, we suggest that the multi-mode pain management scheme has a positive effect on the rehabilitation of patients with rotator cuff injury.

1. Introduction

Rotator cuff, is a group of muscle bond complex around the hazy bone. The front of the hazy

bone is the shoulder foot muscle leg, the upper part is the supraspinatus muscle leg, the rear part is the infraspinatus muscle key and the small round muscle key. The movement of these muscle keys leads to the shoulder joint's internal rotation, external rotation and upward lifting activities, but more importantly, these muscle keys stabilize the hazy bone on the shoulder foot pelvis, It plays an important role in maintaining the stability and movement of shoulder joint. Rotator cuff injury is one of the most common musculoskeletal diseases, accounting for 17% - 41% of the shoulder diseases. It is the main cause of shoulder pain and dysfunction, which seriously affects the life and work of patients. In the rotator cuff, the supraspinatus muscle is the intersection of strength concentration around the shoulder, so it is easy to be damaged. Especially when the shoulder abduction is frequent, the supraspinatus muscle bond passes through the narrow space under the acromion and on the hazy bone, so it is easy to be squeezed, rubbed and damaged, resulting in aseptic inflammation or broken muscle bond. The rest of the infraspinatus, the soleus of the shoulder and the teres minor muscles can also be damaged at the same time, but because of the particularity of the position and structure of the supraspinatus muscle bond, the symptoms of the supraspinatus muscle leg are more prominent. The injury of these muscle keys and aseptic inflammation or the rupture of supraspinatus muscle keys are the rotator cuff injury. After the rotator cuff injury, the patients often feel more pain on the outside of the shoulder. The pain is aggravated during the abduction, the active abduction of the shoulder is limited, and there is obvious pressing pain on the large tubercle of the hazy bone. When the muscles of the rotator cuff are paralyzed, the shoulder joint must show dislocation. Calcification of rotator cuff can cause shoulder pain and corresponding limitation of movement. Rotator cuff injury is usually treated with manipulation, but those with complete rupture of muscle bond are treated with surgery. There are many methods for the treatment of rotator cuff injury in clinic. The difficulty of the repair lies in the reconstruction of the muscle bond bone interface. It has been proved that appropriate stress stimulation can promote the reconstruction, but the mechanism is not clear.

At present, the mechanism of rotator cuff injury can be roughly divided into two views: endogenous injury mechanism and exogenous injury mechanism. Endogenous injury mechanism refers to the damage of muscle bond caused by excessive weight-bearing, endogenous degeneration or other injuries. The mechanism of exogenous injury refers to the injury of muscle bond caused by compression of surrounding tissues, especially the coracoacromial arch. It can be explained by the following four theories: blood circulation theory, degeneration theory, impact theory and trauma theory. In China, 73 injured swimmers were investigated through a large sample of epidemiological study in athletes. It was found that 6 (17%) of them suffered from rotator cuff injury. But in the common people, the rotator cuff injury only accounts for 17% of the shoulder joint diseases, and most of them are the elderly. This shows that rotator cuff injury is mainly in the middle of special groups (such as athletes and the elderly). All kinds of theories are the cause of rotator cuff injury, but which is the main cause has not been determined.

At present, arthroscopic operation has become one of the main methods to treat a variety of shoulder diseases, relieve shoulder pain and reconstruct shoulder function. However, severe pain often occurs after shoulder surgery, which greatly affects the recovery of joint function and the improvement of quality of life. In recent years, with the increasing attention to postoperative pain, postoperative pain control has become one of the key issues of most surgeons. At present, there are not many researches on the pain improvement after the operation of rotator cuff injury at home and abroad. Aiming at this problem, this paper will study the application of multi-mode pain management scheme in the perioperative period after the operation of rotator cuff injury.

Firstly, the basic theories of rotator cuff injury and postoperative pain were summarized in detail, and their pathogenesis and influencing factors were analyzed. According to the theoretical analysis,

the postoperative pain management is of great significance to the rehabilitation of patients, both physically and psychologically. In order to further verify the effect of multimodal pain management scheme in the actual treatment; this paper established the relevant experimental model. All the samples in this study were from real cases. After strict screening, 44 volunteers were selected. In order to ensure the authenticity, effectiveness and quality of the experiment, according to the actual conditions of patients, this paper unifies the operation scheme, postoperative rehabilitation means and evaluation indicators. 44 patients were randomly divided into traditional group and multimodal management group, and a number of tests including UCLA score, VAS score and postoperative complications were compared before and after treatment. By comparing the data, we can see that the multi-mode management scheme adopted in this paper has obvious advantages over the traditional scheme in a number of trials, and the patients who adopt the multi-mode management scheme have a good overall postoperative recovery. Especially in the aspect of complications, it further proves the superiority of multimodal management scheme in the rehabilitation work after the operation of rotator cuff injury, which can be applied in the diagnosis and treatment of patients in clinical practice [1-3].

2. Basic Theory of Rotator Cuff Injury

2.1. Origin of Symptom and Disease Name

In the classical literature, there is no direct record of the disease name of "rotator cuff injury", but according to the clinical symptoms of rotator cuff injury, shoulder pain, limited movement of the shoulder joint, it is attributed to related diseases, such as "arthralgia of the shoulder", "arthralgia", "shoulder congealing", etc. As early as the moxibustion Sutra of Yin Yang and ten pulse moxibustion unearthed in Mawangdui Han tomb has the symptom description of "shoulder like detachment", and then there are "shoulder not to be lifted" and "shoulder pain" in Lingshu Jingmai. The acupuncture and moxibustion A and B Sutra of Wei and Jin Dynasties has made clear the clinical manifestations of shoulder pain such as "shoulder pain cannot be lifted" and "arm cannot be lifted". Zhang Zhongjing put forward in "the outline of the golden plaque" that "or if the arm fails, this is bi".

In ancient times, due to the limitation of medical diagnosis technology, the real cause of shoulder pain could not be found. In modern times, due to wars and other reasons, medical diagnosis and treatment technology could not be developed. Until the continuous development of modern medicine, the diagnosis of shoulder disease was more in-depth and clear, and the part of shoulder pain that was mistakenly classified as "periarthritis of shoulder" was separated, and it was listed as rotator cuff injury [4-5].

2.2. Pathogenesis of Rotator Cuff Injury

The main causes of rotator cuff injury are rotator cuff degeneration, rotator cuff impact syndrome and rotator cuff injury. There are many related factors of rotator cuff injury, such as age, gender, ischemic disease, calcification of rotator cuff, fat infiltration and so on, which can be induced by one or more factors. Impact syndrome is due to the narrowing of the subacromial channel caused by various factors. When the shoulder is moving, the tendon, ligament, bursa and other soft tissues between the acromial and the same bone are repeatedly rubbed to cause tendon degeneration, resulting in the tear of the rotator cuff synovium, and finally the tear of the whole rotator cuff [6-7].

2.3. Pain Mechanism of Rotator Cuff Injury

Some scholars found that the pain of patients with rotator cuff injury had no obvious corresponding relationship with the extent and extent of the injury reflected by the imaging examination, while the inflammatory factor TNF - α in the glide capsule of acromion. The high expression and release of IL-1 α and IL-1 β are the important causes of clinical pain symptoms, which are positively correlated with the pain of rotator cuff injury. Tumor necrosis factor, interleukin, matrix metalloproteinase and cyclooxygenase can be found in the acromiocyst of patients with rotator cuff injury. These mediators are markers of inflammation and the main cause of shoulder pain.

2.4. Correlative Factors of Rotator Cuff Diseases

(1) Age

The study found that there is a certain correlation between the age and the prevalence of rotator cuff injury. People over 45 years old are more likely to have rotator cuff injury than other age groups. The prevalence of rotator cuff injury is 15% in the age of 50, 25% in the age of 60 and 32% in the age of 70. It can be seen that there is a certain correlation between the incidences of rotator cuff injury with age.

(2) Gender

According to the study, there is a certain correlation between gender and rotator cuff injury. The prevalence rate of women is higher than that of men, which may be related to the changes of hormone and other endocrine levels and proteoglycan in women.

(3) Ischemic disease

There are many muscle cavities in the rotator cuff area, which need a large range of activities, large oxygen consumption and a high demand for blood supply. Some studies have found that the blood supply in the rotator cuff area is poor, especially the medial joint surface of the rotator cuff is more serious; it has been found that there is an ischemic area near the supraspinatus muscle stop of the artery of the rotator and spleen; the pathological study of the specimen can determine the existence of the ischemic area, with the prolongation of the ischemic time, the muscle ductility is reduced, and the area is very vulnerable to damage, Therefore, it is considered that this factor has a great correlation with rotator cuff damage.

(4) Fatty infiltration

According to a large number of clinical studies, some scholars found that rotator cuff injury is not only a muscle bond lesion, but also a muscle often involved. Rotator cuff injury is often accompanied by the tear of muscle, which may cause the muscle in the tear to have slow, irreversible fat infiltration. Fat infiltration is an important factor in the pathological development of rotator cuff injury, such as the change of muscle microstructure, the reduction of muscle sarcomere, myofibrillar degeneration, fat cells flooding in and out of the muscle bundle and tendons. Therefore, fat infiltration in rotator cuff injury has certain relevance.

(5) Compared with ordinary people, athletes with sports strain are more likely to have all kinds of sports injuries. For athletes needing upper limb abduction, the muscle keys of shoulder sleeves are in constant friction, collision and traction. The incidence rate of rotator cuff injury is higher than that of [8-9].

2.5. Clinical Characteristics of Rotator Cuff Injury

(1) In the early stage, pain is the only symptom. The pain is intermittent. It is very painful at

night. It is induced after tiredness and can be relieved after rest. The pain is mainly in the deltoid muscle area and in front of the shoulder. In the middle stage, the pain is aggravated and often persistent. The tenderness is obvious at the acromion and the greater tubercle of the humerus. Sometimes, the patient is difficult to sleep because of the pain.

(2) Limited movement of shoulder joint: it is often seen in the middle and late stage of the disease, and the affected limb cannot complete abduction, lifting and extension, especially in abduction.

(3) Muscular atrophy: it can be seen in the patients with long-term rotator cuff injury or the elderly and infirm patients, especially the supraspinatus muscular atrophy.

(4) Pain arc sign of shoulder joint: pain occurs when the patient abducts 60-120 degrees, which is positive. Because of the collision between the acromion and the marginal path, the maximum stress is received on the rotator cuff.

(5) Shoulder joint impact test: when the acromion collides with the greater tubercle of humerus, the pain is positive.

3. Core Concept of Postoperative Pain

3.1. Concept of Pain

In 1986, the International Association for pain research defined pain as the unpleasant feeling and emotional experience caused by the real or potential tissue damage, which is the protective response of the body to the injury, including the pain feeling generated by the injury stimulation and the individual response to the injury. As for the acute pain after operation, if it is not treated in time, long-term pain stimulation will induce the change of neurons, so that the acute pain will gradually develop into chronic pain.

3.2. Mechanism and Source of Postoperative Pain

The perception and transmission of pain involve many levels of anatomical structure and pain signal transduction pathway. The injury of surgery can stimulate the release of many chemical and cytokines, such as prostaglandin, bradykinin, interleukin, opioid peptide, etc., so as to activate the peripheral injury receptors and form nerve impulses to the dorsal root ganglion of spinal cord through nerve fibers, Then it is transmitted from the dorsal horn of the spinal cord to the thalamus, and reaches the sensory area of the central posterior gyrus through the thalamocortical tract, producing pain sensation. The postoperative pain mainly comes from the existing pain before the operation, the stimulation caused by the traumatic operation during the operation, the secondary inflammation and abnormal nerve activity after the operation. The postoperative incision pain is also related to the hyperalgesia induced by high-dose opioids, peripheral and central sensitization, and the nerve pain caused by peripheral nerve injury, Some studies have shown that it may also be related to AMPA receptor / ka ionic excitatory amino acid receptor, but the role of central sensitization in postoperative persistent pain is still controversial [10-11].

3.3. Advantages of Multimodal Analgesia Concept

Multimodal analgesia uses a variety of analgesic drugs and methods, which can effectively and stably control the pain and reduce the side effects of a single drug. Opioid drugs are mainly combined with opioid receptors, which act on the center and can inhibit the central pain perception; NSAIDs can reduce the concentration of prostaglandins in peripheral and central areas, block the

afferent sensation of injury, reduce the central sensitization, and inhibit the cyclooxygenase in the center, so as to reduce the dosage of opioid drugs and reduce the postoperative pain score. The combination of opioids and steroids can not only reduce the use of opioids, but also reduce the side effects such as nausea, vomiting and sedation. A meta-analysis showed that multimodal analgesia with NSAIDs could significantly reduce the dosage of morphine by 15% - 55%. At the same time, studies have shown that early and limited use of opioids has little impact on patients, and the side effects of opioids are mostly dose-dependent. Therefore, based on the above theory, the application of fentanyl under the acromion two days after operation can greatly reduce the pain [12-13].

4. Test Object and Method

4.1. Research Object

From August 2015 to July 2019, a retrospective study was carried out on 44 patients diagnosed as small and medium-sized rotator cuff injury and underwent arthroscopic rotator cuff repair in Affiliated Hospital of a university, including 12 males and 32 females, with the minimum age of 48 years and the maximum age of 79 years (58.07 ± 9.40 years on average), 11 left and 33 right shoulders, with the minimum course of 2 months and the maximum duration of 16 months (8.93 ± 4.54 months on average); All patients presented with different degrees of shoulder pain, especially at night. The shoulder joint on the affected side had different degrees of movement limitation. Each patient had received non-surgical treatment for more than 2 months before the operation, which had poor or invalid effect. According to the different ways of analgesia, patients were divided into conventional analgesia group (group A) and multimodal combined analgesia group (group B).

4.2. Inclusion Criteria

(1) Age > 18.

(2) Combined with the history, symptoms, physical signs, X-ray and MR examination, it was diagnosed as rotator cuff injury and confirmed under the microscope.

(3) Type of injury: small (<1cm) and medium (1-3cm) injuries in post classification; only one rotator cuff injury (mainly supraspinatus tendon injury) is involved in Gerber classification, and the degree of injury is verified to be small and medium under arthroscopy during operation, including partial thickness tear within the two classifications.

(4) Indications for operation: rotator cuff injury is ineffective or the symptoms are aggravated after repeated non-surgical treatment for 1-2 months.

(5) No contraindications were found.

(6) All operations were performed by the same group of doctors, followed up regularly after the operation, and cooperated with the doctors to insist on rehabilitation exercise.

4.3. Exclusion Criteria

(1) Those who do not meet the above inclusion criteria.

(2) Other shoulder diseases (severe osteoporosis, tumor, shoulder fracture, rheumatoid arthritis, suppurative arthritis, joint stiffness, severe atrophy of shoulder muscle, glenoid lip injury, including large, giant and irreparable rotator cuff injuries).

(3) Those who do not cooperate with the postoperative rehabilitation exercise or cannot perform rehabilitation exercise due to the presence of limb paralysis and other diseases, and those who cannot cooperate with the follow-up; and patients with incomplete data.

(4) General condition is poor, there are serious circulatory, respiratory, blood system and other diseases cannot tolerate surgery and psychiatric patients.

4.4. Preoperative Preparation

(1) To inquire and collect the history in detail to make clear the cause, pathogenesis, diagnosis and treatment process of rotator cuff injury.

(2) After admission, we should actively improve the patient's comprehensive physical examination, imaging examination, laboratory examination and make systemic evaluation, fully eliminate the contraindications of surgery, especially systemic diseases, and actively adjust to the acceptable range of surgery before operation.

(3) According to the patient's personal situation, make the best operation plan.

(4) Fully communicate with patients before operation, know patients' mental state and expectation of operation results, sign operation consent and operation grouping informed consent, and conduct functional exercise teaching before operation.

4.5. Anesthesia Mode

General anesthesia was used in all patients. General anesthesia has advantages over local anesthesia in analgesic effect, anesthesia time can be grasped at any time, and anesthesia safety coefficient is high; patients are generally allowed to use intraoperative controlled hypotension (to control the systolic pressure at 90-100mmhg) to effectively reduce intra-articular osmolality in order to ensure a clear surgical vision [14].

4.6. Arthroscopy

In order to facilitate the location of the incision, the surgeon marked the acromion, howl process and clavicle with the surgical marker after the operation position was set and before the disinfection. The movement and stability of shoulder joint were examined under anesthesia, and joint release was performed by hand if necessary. For the traction of the affected limb, the sterile towel and waterproof sheet shall be laid after the routine disinfection, and the standard anterior, posterior and lateral approaches shall be adopted, and other auxiliary channels can be established according to the needs [15].

4.7. Acromioplasty

Remove the arthroscope from the joint, insert the arthroscope into the subacromial space again at the rear incision position, clean the subacromial space with planer knife, clean the bursa, stop bleeding with plasma knife, and expose the anterolateral side of the acromial. Establish the lateral approach (located between the acromion and the hazy bone, to avoid the axillary nerve injury due to too low position), put in the grinding drill, complete the acromioplasty, restore the height of the subacromial space to the working acromion, and if necessary, remove the distal clavicle in the joint. When performing acromioplasty, the degree of shoulder joint stability should be fully considered to avoid the instability of shoulder joint caused by excessive coracoacromial ligament resection and acromiectomy.

4.8. Repair of Rotator Cuff

Probe hook is used to probe the upper surface of the rotator cuff, determine the torn part and scope of the rotator cuff, clean the damaged edge of the rotator cuff with a planer, remove the necrotic tissue, and free the adhesion of the upper and lower edge of the rotator cuff to a state of no tension or low tension. Through the anterior and lateral approaches, use the calibrated probe to measure the size of the anterior and posterior diameter and the internal and external diameter of the tear respectively. If the tear is partial thickness, probe the tear thickness, and the patients who meet the operation standard will change the partial thickness tear into full thickness tear. Before repairing, the toughness and repairability of the rotator cuff were evaluated by the probe hook, and the edge of the broken end was pulled by the gripper to measure its activity and evaluate its tension. The bone surface of the footprints of the rotator cuff was exposed by the plasma knife. If there was any large nodule hyperplasia, the bone surface of the footprints of the rotator cuff could be polished by the grinding drill, and the bone cortex of the footprints of the rotator cuff could be removed.

According to the degree of injury, punch was used to implant the bone tunnel, which was 45 °to the bone surface. The depth of penetration was subject to the reference mark. 4.5mm * l5mm corkscrew was screwed into the biological composite full thread anchor, The number of anchors depends on the size of rotator cuff damage, and the direction of screw in is generally the same as that of bone tunnel. Rotate the handle of the anchor implant clockwise until the anchor body is flush with the bone. The tail end of each anchor contains two non-absorbable sutures. Thread one of the sutures 5-10 mm from the tear edge of the proximal end with PDS thread and suture hook thread, and tie with the other suture for fixation. Use the knot pusher to assist in tying, usually 5-6 knots. Cut off the end of the seam with a thread cutter. Suture incision, sterile dressing, abduction and fixation of the affected limb, and at the end of the operation, a catheter was put into the foramen and kept under the acromion, and the catheter was connected with an analgesic pump.

4.9. Prevention of Infection

According to the national principle of prophylactic antibiotics, all patients used antibiotics 30 minutes before and 24-48 hours after operation. Every 2-3 days, aseptic dressing change was performed on the incision, blood routine examination was conducted regularly, and wound infection was actively prevented and treated.

4.10. Drug Analgesia

The patients in group A took nonsteroidal anti-inflammatory drugs and NSAIDs regularly 3 days before and 2 weeks after operation.The patient in group B took nonsteroidal anti-inflammatory drugs three days before and 0.15% ropivacaine + fentanyl 50ug + normal saline were used for subacromial analgesia two days after operation,. The above two analgesic programs can not only directly play the role of anti-inflammatory and analgesic, but also improve the body's pain threshold after surgery, and can be taken before surgery, which can significantly alleviate postoperative pain. Stop taking if there is adverse drug reaction.

4.11. Rehabilitation Exercise

Postoperative rehabilitation is a process of integration and individuation by stages, not a fixed protocol, in which surgeons, physiotherapists and patients they are indispensable. A good rehabilitation plan should be established according to the patients' injury situation, patients' life

style and expectations. It is not urgent to achieve quick results and instant benefits, and ignore the time and process of biological tissue healing, so as to achieve the best results and functional recovery. In this study, all patients used the standard rehabilitation plan, and the same rehabilitation technician NSAIDconducted rehabilitation guidance for the two groups of patients after operation. After operation, the affected shoulder was fixed in the position of 20 °- 30 °with abduction brace for 3-6 weeks.

4.12. Evaluating Indicator

Since the patients mainly performed passive functional exercise within 6 weeks after operation, the postoperative observation time was from January, and then UCLA score and VAS score were performed in time, 1 week, 2 weeks and 4 weeks before and after operation. The results of each stage of the two groups were compared, UCLA score and VAS score.

4.13. Statistical Analysis Method

Spss19.0 statistical software was used to analyze the counting data. X test was used to count the data. The measurement data was expressed as mean ± standard deviation. Independent sample t test was used for comparison between groups. Paired t test was used for comparison before and after operation in groups. The test level $\alpha=0.05$, $P<0.05$ was statistically significant.

5. Test Results and Analysis

5.1. VAS Score Before and After Treatment

According to Table 1 and Figure 1, before treatment, the VAS scores of the traditional group and the multimodal combination group were 6.05±0.10 and 5.95±0.10 respectively, and there was no statistical difference between the groups by single factor analysis of variance ($P>0.05$). The VAS score between the two groups was measured repeatedly by ANOVA, $w = 0.174$, $P<0.01$, which did not conform to the "spherical symmetry". The multivariate ANOVA model was used, and the treatment factor between the two groups was $f=39.23$, $P<0.01$, which was statistically significant. It can be considered that the VAS scores of the three groups were different. After treatment, the VAS score of the two groups decreased with the time. Compared with the traditional group, the VAS score of the multimodal combination group decreased significantly, especially at the instant of treatment. The paired t-test showed that, compared with the traditional group, the multimodal combined group had statistical significance ($P<0.05$) immediately after treatment, 1 week after treatment, 2 weeks after treatment, and 4 weeks after treatment. According to the above results, both treatment methods can reduce the VAS score, which shows that the two treatment methods have certain efficacy in relieving shoulder pain, but the improvement of VAS score in the multimodal combination group is better than that in the traditional group.

Table 1. VAS score statistics of two groups of patients

Time	Traditional group	Multimodal joint group
Before treatment	6.05±0.10	5.95±0.10
Timely after treatment	5.97±0.10	3.12±0.75
1 week after treatment	3.88±0.93	2.34±0.69
2 weeks after treatment	3.49±0.58	1.81±0.71
4 weeks after treatment	2.61±0.55	0.72±0.62

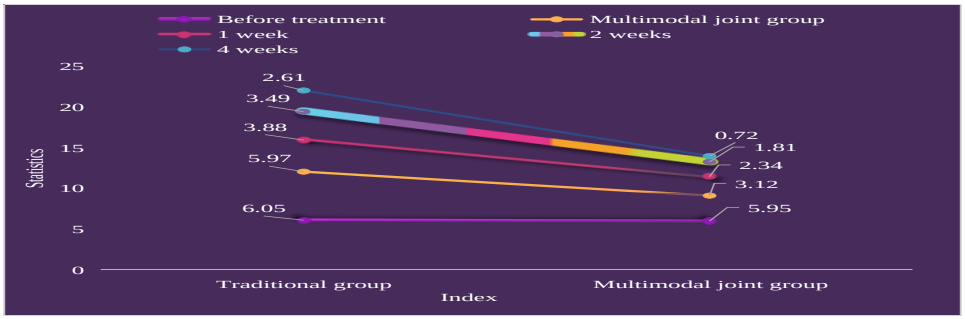

Figure 1. Statistical analysis of VAS scores of two groups of patients

5.2. Evaluation of the Degree of Shoulder Flexion and Lifting Before and After Treatment

It can be seen from Table 2 and Figure 2 that the number of shoulder joint forward flexion and upward lift between the two groups is analyzed by the repeated measurement of variance, w = 0.13, P < 0.01, which is not in line with the "spherical symmetry". Using the multivariate analysis of variance model, the inter group processing effect is f = 12.88, P < 0.01, which is statistically significant. It can be considered that the different scores of the number of forward flexion and upward lift between the traditional group and the multi-mode combined group are different. After the treatment, the degree of flexion and lifting increased with the time. Compared with the traditional group, the multi-mode combined group's forward bending and upward lifting speed is faster, especially at this time point of treatment. It can be seen from the above results that the two treatment methods can improve the degree of shoulder joint forward flexion and upward lift of patients, which shows that the two treatment methods have certain effect in improving the degree of shoulder joint forward flexion and upward lift of patients, but the degree of rise of the degree of forward flexion and upward lift of multi-mode combination group is better than that of traditional group, in improving the degree of shoulder joint forward flexion and upward lift.

Table 2. Statistical table of shoulder joint forward flexion and upward lifting degree in two groups

Time	Traditional group	Multimodal joint group
Before treatment	133.69±10.87	136.15±14.21
Timely after treatment	135.11±10.66	153.69±9.87
1 week after treatment	149.28±12.85	165.87±5.58
2 weeks after treatment	155.21±12.16	170.14±6.04
4 weeks after treatment	158.13±10.39	176.92±5.17

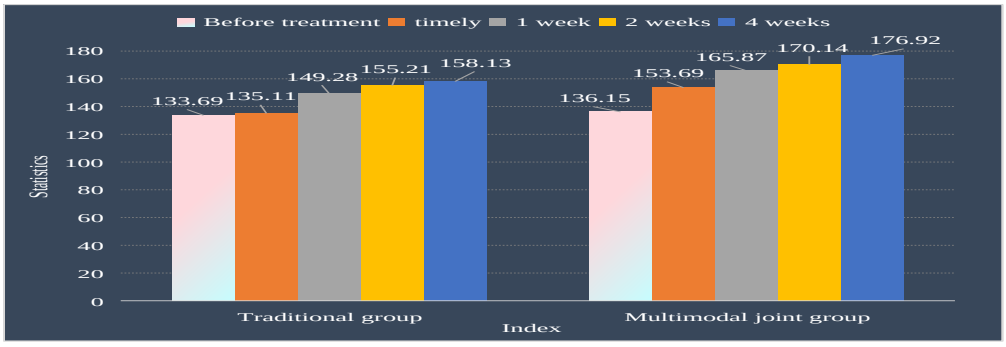

Figure 2. Statistical analysis of shoulder forward flexion and lift in both groups

5.3. UCLA Score Before and After Treatment

It can be seen from Table 3 and Figure 3 that there are 0 cases of "excellent" grade, 1 case of "good" grade and 21 cases of "poor" grade in the patients of the pre transmission group; 0 cases of "excellent" grade, 0 case of "good" grade and 22 cases of "poor" grade in the patients of the ultrasound group. Before treatment, the data of the two groups passed the Kruskal Wallis h test, H = 2.124, P = 0.356. It cannot be considered that the UCLA scores of the two groups were different before treatment. In the last follow-up, there were 15 patients with "excellent" grade, 7 patients with "good" grade, 0 patients with "poor" grade in the multimodal combination group, 4 patients with "excellent" grade, 7 patients with "good" grade, and 9 patients with "poor" grade in the traditional group. It can be seen that the number of patients with "excellent" grade in the UCLA score in the multimodal combination group after treatment was significantly higher than that in the traditional group, indicating that the effect of multimodal combination analgesia is better than that of traditional analgesia.

Table 3. UCLA score before and after treatment in two groups.

Group		Before treatment	Immediately after treatment	1 week after treatment	2 weeks after treatment	4 weeks after treatment
Traditional group	Excellent	0	0	0	2	4
	Good	1	1	2	3	7
	Difference	21	21	20	17	9
Multimodal joint group	Excellent	0	0	0	6	15
	Good	0	0	9	16	7
	Difference	22	22	13	0	0

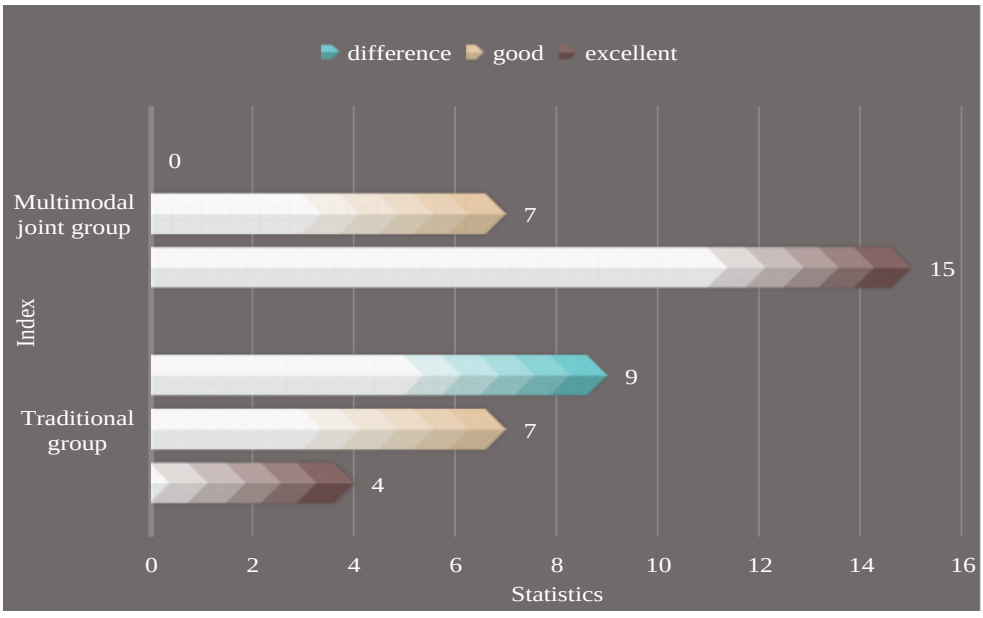

Figure 3. Statistical analysis of UCLA scores in the last follow-up of the two groups

5.4. Statistical Results of Complications

All the patients healed in the first stage without infection.

It can be seen from Table 4 and Figure 4. There were 22 cases in the traditional group, 1 case of

hypoglycemia occurred in the course of preoperative diet prohibition, 1 case of hypoglycemia occurred in the period of postoperative diet prohibition, 4 cases of gastrointestinal reaction occurred, 2 of which occurred after anesthesia recovery, considered to be anesthetics or stress gastric ulcer, the other 2 cases were caused by adverse drug reactions due to shoulder pain and opioids, 1 case of urinary tract infection, 1 case of lower extremity deep vein thrombosis, About 16 days after operation, 8 cases (36.36%) had complications because of lower extremity swelling and uncertain correlation with operation. In the multimodal group, there were 22 cases, only 1 case had gastrointestinal reaction after operation, and the symptoms were relieved after the analgesia pump was shut down, which was related to the analgesic and sedative drugs in the analgesia pump. The complications occurred in 1 case, accounting for 4.54%. Simple comparison between groups, the incidence of complications in the multimodal combination group is significantly lower than that in the traditional group, which shows that the multimodal combination of analgesia can better reduce the incidence of postoperative complications.

Table 4. Statistical results of postoperative complications in two groups

Group	Hypoglycemia	Gastrointestinal Response	Urinary tract infection	Deep vein thrombosis of lower extremity	Total cases	Proportion
Traditional group	2	4	1	1	8	36.36%
Multimodal joint group	0	1	0	0	0	4.54%

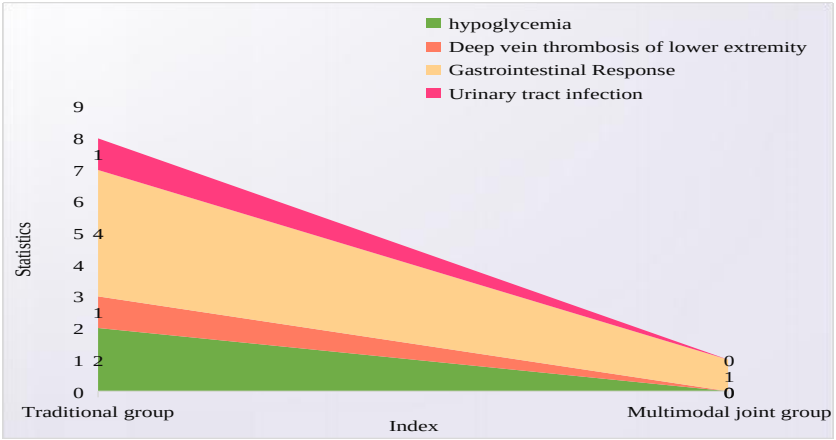

Figure 4. Statistical analysis of postoperative complications in two groups

6. Conclusion

Because of its complicated pathogenesis and many reasons, the degree and scope of the disease are different. At present, there are many treatments for rotator cuff injury, most of which are rehabilitation therapy. For serious patients, the current mainstream treatment is arthroscopic shoulder surgery, which has a good effect, but the postoperative pain is difficult to manage. Severe postoperative pain will affect the recovery of patients, even the psychological impact of patients. In view of this problem, the multi-mode pain management scheme adopted in this paper has many advantages. It is flexible in medication and can be used according to the actual situation of patients. This not only increases the flexibility of the treatment plan, but also reduces the side effects of drugs. In the comparative experiment, through the analysis of the data, we believe that the two

postoperative analgesia schemes can improve the degree of shoulder joint forward flexion and upward lift of patients, which shows that the two schemes can effectively improve the shoulder function of patients, but the multi-mode management group has better performance than the traditional scheme. Compared with other experiments, it can be concluded that the multi-mode management scheme is further optimized in the traditional scheme. The short-term effect after operation is not significantly different from the traditional scheme, but it has obvious advantages in the middle and late stage of rehabilitation therapy. In the comparison of the statistical results of postoperative complications, only one case of multimodal management scheme occurred, which also shows that this scheme can better control the occurrence of complications and bring help to the postoperative rehabilitation of patients.

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Data Availability

Data sharing is not applicable to this article as no new data were created or analysed in this study.

Conflict of Interest

The author states that this article has no conflict of interest.

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