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Original article

Efficacy of multimodal analgesia injection combined with corticosteroids after arthroscopic rotator cuff repair

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ABSTRACT

Introduction: Although arthroscopic rotator cuff repair is minimally invasive, there is still considerable postoperative pain, especially during the first 48 hours. The present study assessed the short-term efficacy and safety of multimodal analgesic (MMA) injection associated to corticosteroids in arthroscopic rotator cuff tear surgery.
Material and method: A single-center prospective randomized study included 50 patients undergoing arthroscopic rotator cuff tear surgery. The study group received subacromial injection of a mixture of morphine, ropivacaine and methylprednisolone associated to intra-articular injection of morphine plus methylprednisolone; the control group received only isotonic saline. All patients had had 24 hours self-administered morphine associated to standard analgesia. Postoperative data were recorded at 30 minutes and 1, 2, 4, 6, 12, 18 and 24 hours: pain intensity, morphine intake and side effects, and also time to first morphine bolus and additional analgesic intake. Constant, ASES and SST functional scores were recorded at 3 months.
Results: Postoperative pain was significantly less intense in the MMA group than in controls at 30 min, H1, H4, H6, H12, H18 and H24 ($P < 0.05$). A rebound at D10 occurred in both groups. During the first 24 hours, MMA significantly reduced cumulative resort to morphine ($P < 0.05$ at H1/2, $P < 0.001$ at H1–24). Mean time to first bolus was significantly longer in the MMA group (71.6 vs. 33 min; $P < 0.05$). The rate of opioid-related side effects was similar between groups. At last follow-up, functional scores were similar between groups. There were no cases of infection or delayed skin healing.
Conclusion: MMA associated to corticosteroids after arthroscopic rotator cuff tear surgery provided immediate benefit in terms of analgesia and morphine sparing, without apparent risk of infection. The practice is presently little known in France and deserves longer-term assessment, especially as regards functional rehabilitation and tendon healing.
Level of evidence: 2.

1. Introduction

Compared to traditional open surgery, arthroscopic rotator cuff repair is increasingly performed due to its minimally invasive nature, intra-articular diagnostic precision, simple postoperative course and low morbidity [1–3]. While arthroscopic management reduces postoperative pain, rotator cuff repair still involves severe pain, especially during the first 48 hours [1,4–10], not only causing considerable discomfort but also vitiating functional rehabilitation and lengthening hospital stay [9,11–13].

Patient-controlled analgesia (PCA) by intravenous opioid perfusion is the standard postoperative analgesic practice for most orthopedic surgery, with the patient controlling dosage according to pain [14]. The technique, however, has certain limitations in the case of shoulder surgery: notably poor relief of mobilization pain, and side effects including nausea and vomiting, pruritus, urinary retention, sedation, hypoventilation and constipation [9,15].

In response to these drawbacks, multimodal analgesia (MMA) has recently been recommended in postoperative pain management [16–22]. The concept is based on associating 2 or more substances or techniques, to improve the quality of analgesia and/or reduce the rate of side effects. The different analgesic substances or techniques act on different complementary sites, inducing additive interactions or synergies.

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Mainly reported in knee and hip surgery, MMA has proved effective in terms of pain management, reduced opioid side effects and early functional rehabilitation [23–25]. Unlike in prosthetic and ligamentous knee surgery [22,26–28], there have been very few studies of the efficacy of MMA protocols in arthroscopic rotator cuff repair. The 2012 studies in this context by the teams led by Cho [17] and Han [18] found local injection to be more effective than PCA in pain management during the first postoperative hours with associated reduction in resort to complementary analgesics and the corresponding side effects.

MMA associated to corticosteroids proved effective and safe in knee replacement [24,29,30], but has as yet been little studied in arthroscopic rotator cuff repair [17]. The present study therefore sought to assess the short-term efficacy and safety of MMA associated to corticosteroids in arthroscopic treatment of full-body rotator cuff tear. The study hypothesis was that MMA associated to corticosteroids reduces postoperative pain and morphine intake.

2. Material and method

2.1. Material

A prospective randomized double-blind placebo-controlled clinical study was approved by the institutional review board; written consent forms were distributed to and signed by all patients.

Inclusion criteria comprised:

- full-body supraspinatus tendon tear, with or without associated infraspinatus or subscapularis tendon involvement;
- frontal supraspinatus tendon retraction < grade 3 on the Patte classification [31];
- muscular atrophy ≤ grade 2 on the Thomazeau classification [32];
- fatty infiltration ≤ grade 3 on the Goutallier classification [33].

Exclusion criteria were:

- ASA (American Society of Anesthesiologists) score ≥3;
- history of drug abuse;
- allergy to study drugs and/or local anesthetics;
- severe neurologic or psychiatric disorder;
- chronic corticosteroid treatment;
- severe capsulitis.

Between December 2012 and February 2013, 54 patients undergoing arthroscopic rotator cuff repair were enrolled. Two (4%) were excluded during the study: one for psychological reasons and the other due to undesired interscalene block during a routine procedure at the beginning of the study. Two others (4%) were lost to follow-up.

The series thus comprised 50 patients: 22 male (44%), 28 female (56%); mean age: 63 ± 8.89 years (range: 44–79 years). Mean follow-up was 4.5 ± 0.26 months (range: 5.1–3.4 months).

Ahead of each procedure, patients were randomized between 2 groups by an independent agent. The study group (25 patients) received postoperative multi-site injection of a mixture of 10 mg morphine, 75 mg ropivacaine and 120 mg methylprednisolone (Fig. 1); the control group (25 patients) received only placebo injection of physiological saline without associated corticosteroids.

2.2. Method

2.2.1. Preoperative assessment

Standard preoperative radiological assessment comprised severity of osteoarthritis of the shoulder on the Hamada classification [34]. Tendon lesions were analyzed on contrast-enhanced CT-arthrography in 78% or cases or on MRI in 22%. Assessment criteria comprised:

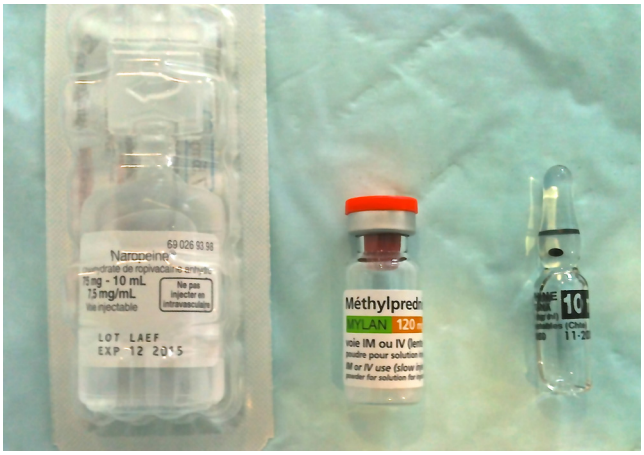

Fig. 1. Analgesic components of the multimodal analgesia.

- type of tear (partial or full-body);
- sagittal extension on the Patte classification [31];
- degree of frontal retraction on the Patte and Bernageau classification [31];
- fatty infiltration on the Goutallier and Bernageau classification [33];
- muscular atrophy on the Thomazeau classification [32].

Subscapularis lesions on preoperative imaging were adjusted on arthroscopic assessment and classified on the new endoscopic classification of the French Arthroscopy Society (Société française d'arthroscopie, 2011) [35].

2.2.2. Anesthesia

All surgery was performed under general anesthesia (thiopental and fentanyl), without complementary peripheral nerve block. Rocuronium was injected to facilitate tracheal intubation. Anesthesia was maintained by sevoflurane and fentanyl.

2.2.3. Surgery

All procedures were performed by the same surgeon using a standardized technique in both groups. Patients were semi-seated. After complete arthroscopic shoulder joint assessment, tenotomy of the long head of the biceps was performed in most cases of tenosynovitis, prerupture or SLAP type II. Tendon repair was systematically preceded by subacromial decompression by bursectomy and acromioplasty using a motorized burr (Table 1). The cuff footprint was then freshened using the burr until the surface was hemorrhagic. Depending on tear size, repair was single or double row, according to the department's habits.

Ahead of surgery, patients were randomized between 2 groups by an independent agent. An instrument nurse ensured preparation ahead of the surgeon's arrival. Syringes were indistinguishable, being of equal volume and visually resembling physiological saline. At end of surgery, the study group received subacromial injection of 10 ml ropivacaine 75 mg and half of a 5 ml preparation of 10 mg morphine and 120 mg methylprednisolone; the other half was then injected into the shoulder joint (Fig. 2). The control group received only physiological saline at the 2 sites.

2.2.4. Analgesia

All patients received a PCA bolus of a mixture of morphine (1 mg/ml, 1 mg bolus, short 8 min refractory period, max. dose