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Original Research

Monitored Anesthesia Care in Uterine Artery Embolization for Leiomyomas and Adenomyosis

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Abstract

Background: Patients undergoing an interventional radiology procedure report some degree of anxiety. Therefore, procedure-related anxiety needs to be managed. The aim of our study was to investigate patient satisfaction with monitored anesthesia care (MAC) for uterine artery embolization (UAE)-related procedural anxiety in symptomatic uterine fibroids or adenomyosis. **Methods**: Between May 2021 and June 2022, 36 patients with symptomatic fibroids or adenomyosis underwent UAE with MAC. Follow-up evaluations consisted of clinical symptoms, degree of satisfaction with MAC in UAE, and complications. **Results**: MAC in UAE was successfully performed in all patients. UAE significantly reduced patients' complaints such as bleeding and pain: the scores for bleeding and pain were significantly reduced after 3 months of UAE compared with those before UAE, indicating the effectiveness of UAE. The mean score of satisfaction with MAC in UAE was 4.3 points, meaning that 94.4% of women were satisfied or very satisfied. No major complications were observed. **Conclusions**: MAC in UAE for symptomatic uterine fibroids or adenomyosis can be emotionally effective and safe for patients who are anxious about the procedure.

Keywords: monitored anesthesia care (MAC); uterine artery embolization (UAE); anxiety; satisfaction

1. Introduction

Since its introduction in 1995, uterine artery embolization (UAE) has become an established option for th treatment of symptomatic leiomyomas [1]. Also, UAE has emerged as a possible treatment method for symptomatic adenomyosis patients [2,3].

Although the UAE technique is considered to be safe and well tolerated, about 68% of patients undergoing an interventional radiology (IR) procedure report some degree of anxiety [4]. Therefore, procedure-related anxiety needs to be managed. In endoscopic procedures, conscious sedation endoscopy was performed as a way to overcome such problems and reduces anxiety about pain and discomfort [5,6].

Monitored anesthesia care (MAC) has been used as a specific anesthesia service for diagnostic or therapeutic procedures performed under local anesthesia along with sedation and analgesia. An essential component of MAC is the periprocedural anesthesia assessment and understanding of the patient's coexisting medical conditions and management of the patient's actual or anticipated physiological derangements during a diagnostic or therapeutic procedure. While MAC may include the administration of sedatives and/or analgesics often used for moderate sedation, the qualified anesthesia provider of MAC is focused exclusively and continuously on the patient for any attendant airway or hemodynamic and physiologic derangements [7,8]. This care procedure results in fewer physiologic disturbances and a more rapid recovery compared to general anesthesia. So, MAC is suitable for outpatient procedures as it helps in fast-tracking recovery [9].

Procedures such as trans arterial chemoembolization (TACE) or UAE performed in IR are typically accompanied by post embolization syndrome (PES). In TACE for hepatocellular carcinoma treatment, the degree of PES is weak because the liver receives dual blood supply, but the degree is severe in UAE. In addition, the symptoms of PES after UAE procedure follow a typical pattern. Therefore, since it is well known that there is considerable pain during and after the procedure in UAE, MAC was performed for the first time in UAE to relieve anxiety about the procedure itself and pain [10].

To the best of our knowledge, there are no reports of the use of MAC to reduce patient anxiety during UAE. Therefore, we aimed to investigate the satisfaction of patients who underwent monitoring anesthesia for UAE-related procedural anxiety among symptomatic leiomyoma and adenomyosis patients.

2. Materials and Methods

2.1 Patients

The institutional review board approved this retrospective study (IRB file no. SCMC-2022-06-007), and the

Table 1. Baseline patient characteristics.

Characteristic	Mean ± SD	Range
Age (years)	45.4 ± 4.3	37–53
Body mass index (kg/m^2)	22.9 ± 3.4	16–30
Parity (no.)	1.6	0–3
Predominant tumor		
Fibroid	9	
Adenomyosis	14	
Combined	13	
Procedure time (minutes)	45.3 ± 10.9	25–70
Monitored anesthesia care time (minutes)	62.1 ± 10.9	45–85

no., number; SD, standard deviation.

need for written informed consent was waived. Between May 2021 and June 2022, 36 patients underwent MAC in UAE for uterine fibroid tumors or adenomyosis. Their ages ranged from 37 to 53 years (median age, 45 years), their body mass index ranged from 16 to 30 kg/m^2 (mean, 22.9 kg/m^2), and their parity ranged from 0 to 3 (mean, 1.6). All women presented with clinical symptoms including dysmenorrhea and menorrhagia. All but two women were premenopausal.

Patients with concurrent uterine fibroid tumor and adenomyosis were also included. Patients wishing to become pregnancy in the future were not excluded and were informed about the potential benefits and risks associated with UAE. Exclusion criteria from the study were acute pelvic infection, pregnancy, gynecologic malignancy, endometriosis, and contraindications or allergy to iodinated contrast agents. The follow-up period ranged from 4–11 months (mean, 7.1 months).

A symptom severity questionnaire was completed to assess the severity of menstrual bleeding and dysmenorrhea during and between menstrual periods on a scale of 0–10 points before UAE and at the time of the three-month follow-up. Also, a degree of satisfaction questionnaire was completed to assess the degree of satisfaction of anxiety during UAE with MAC on a scale from 1 (very dissatisfied) to 5 (very satisfied) at the time of the one-day follow-up visit. MAC-related complications included nausea, vomiting, prolonged sedation, and cardiorespiratory depression. Patient characteristics are summarized in Table 1.

2.2 MAC Procedure

One hour prior to the scheduled UAE procedure, each patient received an intravenous (IV) drip infusion in their arm in the ward. An IV patient-controlled analgesia (PCA) pump was connected to the IV line loaded with 1500 mcg of fentanyl, 60 mg of nefopam, and 200 mcg of dexmedetomidine at 1 mL/h with a 1-mL bolus dose and a set to a lockout time of 8 min. This was continued during and after the procedure. The patient entered the angiography suite and was placed in the supine position. Standard monitoring was performed, which included electrocardiography, non-invasive blood pressure monitoring, and pulse oximetry. The forehead was cleaned with a 70% alcohol swab, and a bispectral index (BIS) monitoring (BIS-XP monitor, Covidien, Minneapolis, Minesota, USA) sensor was attached. Each patient received oxygen at 4 L/min via facemask during the procedure. After obtaining baseline data on vital signs, 3 mg of midazolam and 0.3 μg/kg/h of IV dexmedetomidine were administered until the BIS value reached 60. Before the local anesthesia inguinal injection for femoral artery puncture, 0.5 μg/kg/h of IV dexmedetomidine was administered. The drug levels were adjusted to maintain a BIS value of 60–80 (ensuring sedation during the operative period); continuous vital sign and oxygen saturation monitoring was performed during MAC. The MAC was performed by anesthesiologists (MOL and JA). After embolization of the first uterine artery, 30 mg of ketorolac was administered for postoperative pain control; following embolization of the other uterine artery, IV dexmedetomidine was discontinued. After the UAE procedure, the patients were transferred to the postanesthesia care unit, where their mental status and vital signs were carefully monitored before returning them to the ward.

2.3 UAE Procedure

A unilateral groin was adopted in all cases under local anesthesia. A 5.0-French RUC catheter (Cook, Bloomington, IN, USA) was placed in the iliac artery, and a coaxial 3-French microcatheter (Stride Hi-flow; Asahi Intecc, Osaka, Japan) was advanced distally into the uterine artery. Embolization was performed interventional radiologist with 18 years of experience. Particles (Contour; Boston Scientific, Marlborough, MA, USA) of 150–250 um, 250–355 um and 355–500 um were used sequentially, and these particles were mixed in 40 mL of a 1:1 mixture of saline and contrast agent (Iomeron; Bracco, Milano, Italy). The bilateral uterine arteries were embolized. UAE procedures were as previously described [11].

2.4 Pain Control

Pain within 24 h of the procedure was primarily managed through an IV PCA pump instilled before the procedure. If necessary, nonsteroidal anti-inflammatory analgesics were additionally administered intravenously and oral analgesics were simultaneously prescribed.

2.5 Follow-Up

The clinical response was assessed with questionnaire focused on changes in symptoms of hypermenorrhea and dysmenorrhea at the UAE pre- and 3-month follow-up visit. Patients were asked to report improvement of symptoms on a scale of 0 (little bleeding, no pain) to 10 (severe menorrhagia, severe pain) according to the number of pads used, analgesics, and experiences. Scores for bleeding were assigned based on the number of pads used and scored as follows: 0 points (no pad), 1 point (1–3 pads), 2 points (4–6

Table 2. Outcomes.

	Baseline	3-month follow-up	*p* value
Bleeding score (range)	7.2 (5–9)	2.7 (2–4)	<0.001
Pain score (range)	7.4 (6–9)	2.9 (2–4)	<0.001
Degree of satisfaction with MAC (range)[a]	4.3 (3–5)		

[a]Data collected at the one-day follow-up visit; MAC, monitored anesthesia care.

pads), 3 points (7–9 pads), 4 points (10–12 pads), 5 points (13–15 pads), 6 points (16–18 pads), 7 points (19–21 pads), 8 points (22–24 pads), 9 points (25–27 pads), or 10 points (≥28 pads). Pain was described using the visual analog scale (VAS), and scores ranged from 0 (no pain) to 10 (extreme pain) [12].

The degree of satisfaction was assessed by questionnaire at the one-day follow-up visit. Patients were asked to report their degree of satisfaction on a scale of 1 (very dissatisfied) to 5 (very satisfied). The scores were divided into five levels: very dissatisfied (score of 1), dissatisfied (score of 2), neutral (score of 3), satisfied (score of 4), and very satisfied (score of 5).

2.6 Statistical Analysis

All statistical analyses were performed using SPSS software (version 21.0; IBM Corporation, Armonk, NY, USA). Continuous variables were expressed as mean (SD), while categorical variables were expressed as number (%). Analyses were performed with paired *t* tests and Pearson's chi-square test. $p < 0.05$ was considered statistically significant.

3. Results

Of the 36 patients, 9 had leiomyoma, 14 had adenomyosis, and 13 had both uterine fibroid tumor and adenomyosis. MAC in UAE was successfully performed. The mean scores for menorrhagia and dysmenorrhea were reduced from 7.17 ± 1.04 to 2.72 ± 0.67 and from 7.44 ± 1.04 to 2.89 ± 0.68, respectively ($p < 0.01$ and $p < 0.01$). Most patients reported high satisfaction with MAC (satisfied/very satisfied, 94.4%). The score of MAC satisfaction with UAE-related procedure was 4.3 (Table 2). There were no major complications related to MAC. Three minor complications were observed during procedure, including one case of transient sleep apnea and two cases of bradycardia.

4. Discussion

Anxiety is an unpleasant emotional status or circumstance. Patients undergoing IR procedures experience anxiety that tends to be more pronounced compared to that of patients undergoing diagnostic imaging studies [13,14]. Preprocedural anxiety often begins as soon as the radiologic procedure is scheduled. Women experience greater anxiety than men, and patients scheduled for vascular procedures are more anxious than patients scheduled for non-vascular procedures [15]. Concerns about pain and embarrassment during the procedure are common.

Management of anxiety is complex, and most institutions have used sedative and anxiolytic medications to manage anxiety [16]. Currently, there are no consensus guidelines for anxiety management in IR procedures [17]. In 10%–30% of all surgical procedures, MAC is the first choice [9]. The ability to adjust the sedation level from full consciousness to general anesthesia during the course of a procedure provides maximal flexibility in matching the sedation level to patient needs and procedural requirements [7]. Sedation techniques for MAC often use a combination of agents to provide analgesia, amnesia, and hypnosis with complete and rapid recovery in a manner suiting a particular operative procedure with minimal side effects like postoperative nausea and vomiting (PONV), prolonged sedation, and cardiorespiratory depression [9]. In addition, depending on the choice of drugs, it can help effectively control postoperative pain [18], increasing the patient's satisfaction with the procedure and anesthesia.

When UAE was performed with MAC in the present study, most of the patients expressed high satisfaction, and the average satisfaction score for MAC was 4.3. Two patients scored 3 and all others scored 4 or higher. Both patients with a satisfaction score of 3 did not have any peculiarities other than MAC time longer than the mean. Recently, many studies have shown that intraoperative IV dexmedetomidine significantly reduces postoperative opioid consumption and the addition of dexmedetomidine infusion to opioid PCA provides better analgesia, opioid sparing effect [19–21]. Dexmedetomidine is generally used with opioid-based PCA and is also frequently used in our hospital. In our study, we used dexmedetomidine, an alpha-2 adrenergic receptor agonist known to provide adequate sedation and analgesia with minimal respiratory depression [18]. So, it is presumed that the use of this drug, among other drugs, was more helpful in the satisfaction of the patients with this procedure. The loading dose of dexmedetomidine is usually administered over 10 minutes, followed by the maintenance dose. However, it has been reported that dexmedetomidine decrease heart rate and blood pressure. The effects of dexmedetomidine-induced hypotension and bradycardia may be minimized by omitting or decreasing the loading dose. Therefore, in our study, midazolam bolus was infused without a loading dose of dexmedetomidine. Midazolam is another commonly used intravenous sedative agent with rapid onset and relatively rapid recovery compared to other benzodiazepines.

In the current study, there was one case of sleep apnea, but it was corrected immediately by turning the patient's head. There were also two cases of bradycardia treated by atropine injection. No major complications were observed.

Our study has some limitations. First, the present study was performed at a single institution with a relatively short follow-up period, so a multicenter study should be conducted to confirm our results. Second, this study was not a comparative study. So, randomized controlled trials on the effectiveness of MAC in UAE are needed in the future. Third, this was a retrospective study and included a relatively small number of patients. So, our results should be further validated in a prospective trial.

5. Conclusions

MAC provides safe conscious sedation and anxiety relief when used for patients who are anxious about their procedure. Therefore, if MAC is applied to UAE for symptomatic uterine fibroids or adenomyosis, patients will be able to receive treatment more comfortably.

Take-home message: With the development of medical technology, interventional radiology procedures are increasing, but compared to other surgeries, adequate sedation of the patient during the procedure and attention to pain control after the procedure are not sufficiently performed. Therefore, practitioners should also pay attention to this.

Abbreviations

MAC, Monitored Anesthesia Care; UAE, Uterine Artery Embolization; PCA, Patient-Controlled Analgesia.

Availability of Data and Materials

The datasets used and/or analyzed during the current study are available from the corresponding author on reasonable request.

Author Contributions

MOL and C-WK designed the research study. MOL and JO performed the research. MOL and C-WK analyzed the data. MOL and C-WK wrote the manuscript. All authors contributed to editorial changes in the manuscript. All authors read and approved the final manuscript.

Ethics Approval and Consent to Participate

This retrospective study was approved by Samsung Changwon hospital Institutional Review Board (SCMC 2022-06-007) and informed consent was waived.

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Conflict of Interest

The authors declare no conflict of interest.

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