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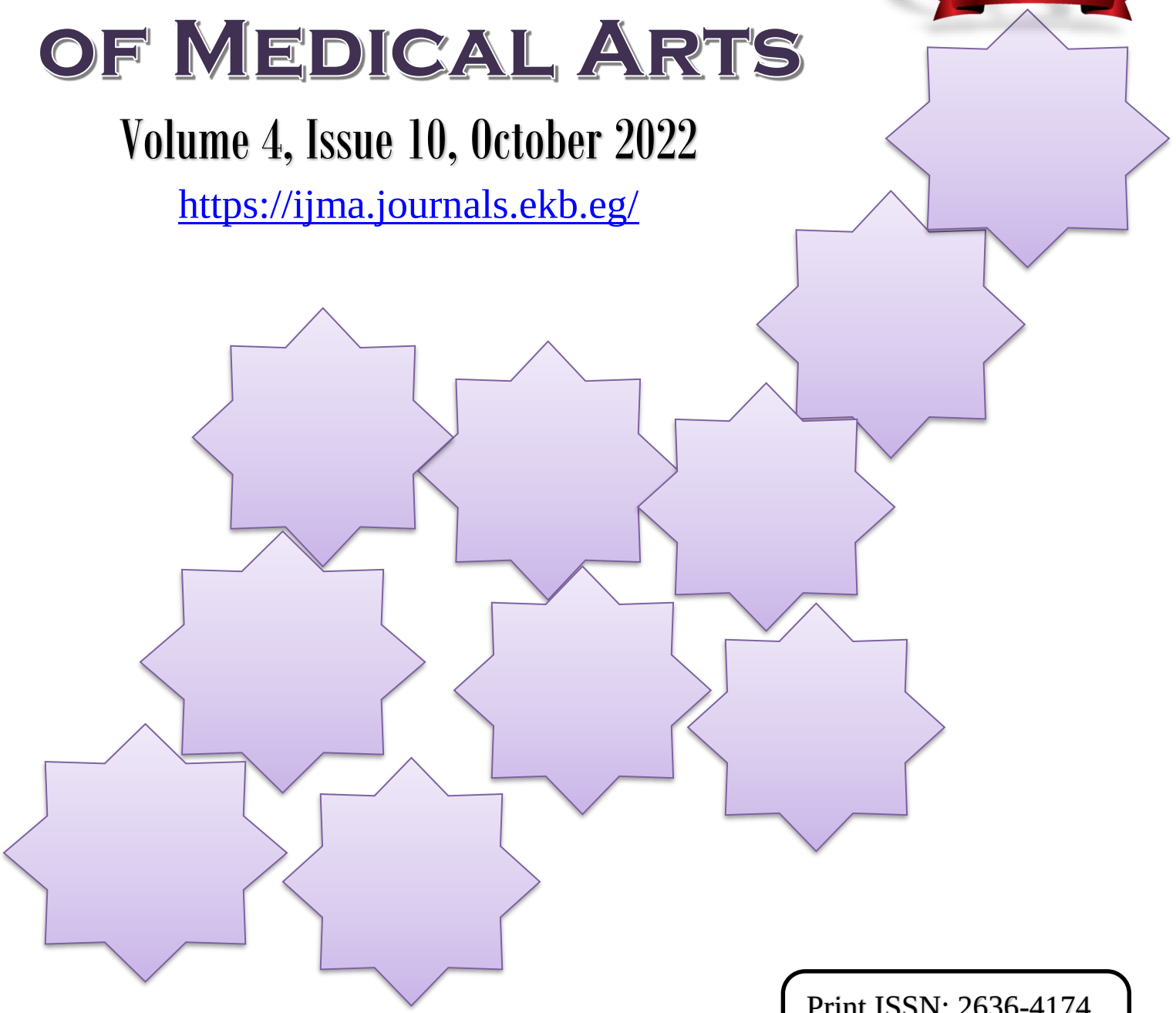

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Original Article

The Analgesic Efficacy and Safety of Ultrasound Guided Trans Abdominis Plane Block Post Cesarean Delivery

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ABSTRACT

Background: Transverses abdominis plane [TAP] block through ultrasound is a unique strategy to block abdominal wall neuro afferents for postoperative analgesia

Aim of the work: The purpose of our research was to assess efficacy and safety of USG-TAP block for treating post-operative pain following cesarean birth.

Patients and methods: This single-centered investigation was carried out at Al-Azhar University Hospital's Obstetrics & Gynecology Department at New Damietta. This research included 90 pregnant women who had elective cesarean deliveries. The patients were separated into three groups: group 1 [n = 30 women] got TAP block, group 2 [n = 30 women] received saline injection, and group 3 [n = 30 women] neither TAP block or saline injection.

Results: When comparing Visual Analogue Scale [VAS] of pain between three groups studied, our findings revealed that VAS was lower among Group 1 in significant way in comparison with Group 2 in all studied time intervals except baseline, while Group 3 had a higher VAS value.

Conclusion: USG-TAP block had effective analgesic effect post cs under spinal anesthesia. This could improves satisfaction of patient in safe and effective way.

Keywords: Ultrasound; Transverses abdominis; Cesarean delivery; Visual Analogue Scale; Spinal anaesthesia.

INTRODUCTION

Pain treatment is part of the basic human rights. Nevertheless, existing information shows precise explanation of pain biology and the overall lack of managment, thus further study is needed to examine alternative techniques of postoperative pain reduction [1]. In many countries, the most common major surgical operation is a cesarean section [CS]. Its usage has expanded over the last 30 years to a level that exceeds the 10-15% of births that is regarded to be ideal. This rise in use has been fueled by a significant increase in CS [not medically indicated]. The likelihood of a woman having a cesarean section is three times higher than it was 20 years ago [2].

Based on Egypt Demographic and Health Survey [EDHS] in 2014, CS gradually climbed in Egypt to 52%, signifying > 100% raise in its rate at 2005. CS is 67.3%, indicating > double the regional neighbors Jordan and Saudi. Egypt now is 3rd highest rate of CS in world, after Dominican Republic and Brazil [3]. Because significant pain is expected following cesarean birth, the soothing protocol must be effective and safe. Inability to regulate postoperative pain following a cesarean birth might have a significant impact on ambulation, nursing, and mother bonding. It is critical for pregnant women for moving early to avoid DVT and for aiding children health [4, 5].

There are a few distinct forms of analgesics to do so, and mixtures of them. However, providing high-quality analgesia is difficult owing to a variety of factors such as medication toxicity, difficulty to locally apply anesthetic agents due to morbid obesity, painful side effects of various anesthetic drugs, and inadequate analgesic impact [6]. Systemic or neuraxial opioids are backbone of postoperative pain treatment since they work on all domains. However, they are linked with variety of unfavorable adverse reactions, NSAIDs could be non-sufficient to relieve post-cesarean pain. For these patients, a multimodal analgesic treatment integrating abdominal nerve block with IV pain killers is more trendy nowadays [7]. TAP block is regional method which inhibits abdominal wall neuro afferents from T6 to L1, alleviating discomfort associated with an abdominal incision. **Rafi** [8] characterized TAP block method in 2001 as "double pop" that occurs when needle travels between external and internal oblique. Before dividing to ant and sup to the abdominal wall, subcostal nerves are blocked. It is a useful analgesic adjuvant for lower abdominal procedures. As a result, if local anesthetic is placed in this region, myo-cutaneous sensory blocking occurs [9].

THE AIM OF THE WORK

The aim of this study is to assess the efficacy and safety of Ultrasound guided Trans Abdominis Plane block in the management of post-operative surgical pain after cesarean delivery. As far as we know, we are the first to examine this topic on the Egyptian population at Damietta.

PATIENTS AND METHODS

Study design and setting: This study was a randomized single-blinded study that included 90 pregnant females who underwent elective lower segment cesarean section under spinal anesthesia at obstetrics & gynecology department, Faculty of Medicine Al Azhar University in New Damietta. Subjects were divided into three groups[30 patients for each group]. Group 1 [n=30]: Cases who were undergone TAP block, Group 2 [n-30]: Cases who were injected by saline Group 3 [n=30]: Cases who neither took saline nor TAP block.

Study population

Inclusion criteria: Pregnant females who were scheduled for elective caesarean section, patients > 18 years, absence of fetal compromise, No major systemic disease as DM, HTN or SLE.

Exclusion criteria: Patient's unwilling TAP block, drug allergy to any medication in the study, BMI [body mass index] more than 35 kg/m² or less than 18 Kg/m², Contraindications to regional anesthesia [bleeding diathesis, infection at the site of block and peripheral neuropathy], Unsatisfactory view of abdominal layers as seen in the ultrasound Intervention[s].

Ethical Considerations: Approval from department of Obstetrics and Gynecology, faculty of medicine, Al Azhar University Damietta and from IRB were obtained. Women identified by their names in data collection sheet, were kept in privacy by investigator. Informed consent was obtained from all participating women in this research after giving them the full information about the study.

Randomization: We used simple randomization method [single sequence of random assignments was done].

Study procedures: All participants underwent the following procedures:

Preoperative assessment: [1] Personal history, obstetrics history, past history of medication and surgeries, menstrual history, and obstetric history; [2] a general and systemic examination; [3] measurements: weight, height, BMI, and waist circumference [WC]; [4] Laboratory investigations: [CBC, Liver function test, kidney function test, ABG, INR and electrolytes]; [5] Obstetric examination; [6] Abdominal examination; and [7] Ultrasonography before CS was performed by one investigator using a transabdominal probe for assessment of Fetal biometry, fetal weight estimates and mniotic fluid measurements.

Anesthesia

spinal anesthesia was used. Pfannenstiel incision was done in all patients. Prophylactic antibiotics were given to all patients and postpartum uterotonics were used.

1. **Group 1:** TAP block was conducted at surgery end and after wound closure under the direction of an ultrasound instrument with a broadband linear array probe 6-11 MHz. After disinfecting and sterilizing the entrance site, which was positioned in midaxillary line halfway between costal border and iliac crest, needle was advanced in neurofascial plane between the IO and TA muscles through plane method. After inserting needle into right location, 40 ml of [10 mml bupivacaine + 4 mg dexamethasone plus saline] was administered. The seeing of hypoechoic part between two muscles after administration of local anesthetic was regarded block's success. This process was done on the opposite side. Anesthesia was discontinued and neuromuscular block was antagonized following the conclusion of the TAP block. Subjects were taken to the post-anesthesia care unit [PACU], where they were examined by resident doctors who were unaware of the concentration of local anesthetic [LA] utilized.

2. **Group 2:** were injected by saline by the same technique as TAP.

3. **Group 3:** did not undergo TAP block nor injected by saline.

Post-operative pain management

To alleviate the visceral component of post-operative pain, all patients were given an analgesic regimen of NSAIDS: two doses of 800 mg IV ibuprofen or a single dosage of 30 mg ketorolac, 800 mg IV ibuprofen at hours 0 and 4. Second dosage of ibuprofen was only given if participant was still in hospital after 4 hours.

Postoperative parameters recorded

The primary goal was to manage pain and evaluate TAP block efficiency. Using ruler, a VAS 0/10 was used to quantify post-operative pain; score was derived through measuring distance between "no pain" and patient's point, with 0-10 score ranges. Scale from 0-10, with 0 = no pain and 10 = suffering. All forms of pelvic pain were classified as mild when the VAS score was 4-5, moderate when the score was 6-7, and severe when the score was 8-10. It was measured every 2 hours following wound closure for a total of 12 hours.

The severity of nausea, vomiting, and drowsiness was rated using a four-point scale [0-none, 1-mild, 2-moderate, and 3-severe].

Statistical Analysis: SPSS 22.0 and MedCalc 13 were utlized to handel the data. Shapiro Walk test was utilized to check distribution of the data. Qualitative data was presented as frequencies and percentages and Chi square test was utilized to evaluate difference between them. Quantitative data was reported as mean [SD] with using one-way ANOVA to compare between them and median [range] with Kruskal-Wallis test to compare between them. A P-value < 0.05: significant.

RESULTS

Table [1] shows the basic and obstetric characteristics of the included patients. The mean age of group 1 was 28.22 ± 4.11 years, group 2 was 27.33 ± 4.91, and group 3 was 28.56 ± 4.31. no significant difference was found between the three groups regarding the patients' demographic characteristics. Moreover, no significant difference between the three studied groups regarding ASA, operative time, and anesthesia time.

Regarding Visual Analogue Scale [VAS] of pain, there was a significant difference between the studied groups regarding nausea and vomiting mild and severe VAS but not moderate [P-value= 0.001] [table 2].

Table [3] shows that there is a significant difference between the three studied groups regarding need for analgesia and time to rescue analgesia.

There was a significant difference between the studied groups regarding nausea and vomiting moderate degree but not mild. The incidence was significantly lower in group 1 [table 4].

Table [1]: Demographic data of the three studied groups

		Group 1 [n=30]	Group 2 [n=30]	Group 3 [n=30]	F	P
Age [years] Mean ± SD		28.22 ± 4.11	27.33 ± 4.91	28.56 ± 4.31	0.609	0.546
BMI [kg/m^2] Mean ± SD		27.44 ± 2.37	28.11 ± 3.62	27.56 ± 2.35	0.474	0.624
Parity Mean ± SD		2.46 ± .824	2.73 ± .908	2.84 ± .857	1.89	0.221
ASA	I II	17 [56.7%] 13 [43.3%]	19 [63.3%] 11 [36.7%]	16 [53.3%] 14 [46.7%]	0.638	0.727
Operative time [min] Mean±SD		64.17 ± 6.25	62.75 ± 5.8	64.24 ± 6.14	0.576	0.561
Anesthesia time [min] Mean±SD		73.63 ± 9.27	72.92 ± 8.77	72.8 ± 9.26	0.265	0.768

Table [2]: Visual Analogue Scale [VAS] of pain between the three studied groups

	Group 1 [n=30]	Group 2 [n=30]	Group 3 [n=30]	χ^2	P
Mild	25 [83.3%]	16 [53.3%]	8 [26.7%]	19	**< 0.001**
Moderate	5 [16.7%]	12 [40%]	13 [43.3%]	5.7	0.058
Severe	0	2 [6.7%]	9 [30%]	13.9	**0.001**

Table [3]: Need for analgesia and time to rescue analgesia

	Group 1 [n=30]	Group 2 [n=30]	Group 3 [n=30]	F	P
Need for analgesia	18 [60%]	22 [73.3%]	30 [100%]	χ^2=14	**.001**
Time to rescue analgesia Mean ± SD	8.44 ± 2.71	8.07 ± 2.38	3.72 ± 3.41	KW=25	**< 0.001**
Time to rescue analgesia					
After 2 hours	1 [5.6%]	5 [22.7%]	18 [60%]	17	**< 0.001**
After 4 hours	2 [11.1%]	7 [31.8%]	8 [26.7%]	2.47	0.291
After 6 hours	4 [22.2%]	6 [27.3%]	3 [10%]	3.28	0.194
After 8 hours	5 [27.8%]	3 [13.6%]	1 [3.3%]	4.12	0.128
After 10 hours	6 [33.3%]	1 [4.5%]	0	15	**0.001**
After 12 hours	6 [33.3%]	2 [11.1%]	0	7.7	**0.021**

Table [4]: Incidence of nausea and vomiting among the studied groups

	Group 1 [n=30]	Group 2 [n=30]	Group 3 [n=30]	χ^2	P
No	27 [90%]	23 [76.7%]	14 [46.7%]	14.39	**0.001**
Mild	2 [6.7%]	4 [13.3%]	7 [23.3%]	3.42	.181
Moderate	1 [3.3%]	3 [10%]	9 [30%]	9.35	**0.009**

DISCUSSION

According to **Jadon *et al.*** [10], 139 moms having CS were randomized to have TAP block with either 20 ml 0.375% ropivacaine or 20 ml saline. No statistically significant difference in age, weight, height, or parity was observed between two groups.

Karatepe and Ozer [11] also compared Group TAPB [25 patients got 20 ml. of 0.25% bupivacaine injected bilaterally] with Group C. [25 cases who did not undergo TAPB]. Regarding age and body weight, no statistically significant difference between two groups was found. Similarly, the study by **Kupiec *et al.*** [12] enrolled 88 women undergoing elective CS allocated to 2 groups. First one had USG- TAP block using 40 mL 0.25% bupivacaine, while second one was treated with no regional nerve block and no statistically significant differences in patient height, weight and BMI was observed. In addition, **Mankikar *et al.*** [13] comprised 60 patients receiving CS under spinal anaesthesia who were randomly assigned to get TAP block with ropivacaine [n = 30] or normal saline [n = 30]. Regarding age and weight, study groups were comparable.

In addition, **Cansiz *et al*. [14]** enrolled two groups randomly: Group T [TAP Block group] [n:35] and Group C [control group] [n:35]. There were no statistically significant differences in the patient age, height and weight. Moreover, **McKeen *et al*. [15]** enlisted 74 women in this double-blind experiment who were randomly allocated to treatment wigh 0.25% ropivacaine or control with 0.9% saline with no statistically significant variations between patients regarding height, weight, or parity.

Regarding clinical features of the three groups analyzed, our findings revealed no significant difference between three groups in terms of ASA, operational time, and anesthetic time**.** In agreement with our findings, **Jadon *et al*. [10]** demonstrated no significant differences in ASA, surgical time, or anesthetic time across the analyzed groups.

Our findings were supported by **Karatepe and Ozer [11]**, who reported that there was no statistically significant difference between the groups regarding surgical time, amount of anesthetic administered, maximum sensory block time, maximum motor block time, and motor block regression time. Furthermore, no statistically significant difference between three analyzed groups regarding ASA and operation time, as well as the maximum time to regression of sensory block level to L1 segment in **Cansiz *et al*. [14]** study. In addition, **Mankikar *et al*. [13]** found that the time to first analgesic administration [tramadol] was considerably longer in the TAP Group [mean 9.53 h] than in the control Group [mean 4.1 h], P=0.0163. In terms of ASA, there was no significant difference between the three groups investigated. This discrepancy might be due to differences in sample characteristics and the dosage employed.

In terms of mean arterial blood pressure [MAP] differences amongst the three examined groups, our findings revealed a substantial drop in the TAP group at 2hr, 4hr, 6hr, 8hr, 12hr, 20hr, and 24hr time intervals. However, **Cansiz *et al*. [14]** demonstrated no significant change in mean arterial pressure across the three examined groups at 1, 4, 6, 12, 18, and 24 hours. Furthermore, **Kupiec *et al*. [12]** and **Mankikar *et al*. [13]** demonstrated no significant change in arterial pressure between two groups.

In terms of the heart rate variations of the three examined groups, we discovered that there is a substantial difference in HR between the three researched groups at 2, 4, 6, 8, and 12-hour time intervals, with group 1 seeing a large reduction. **Cansiz *et al*. [14]** demonstrated no significant difference between three studied groups in terms of heart rate at 1, 4, 6, 12, 18, and 24 hours [p> 0.05]. Furthermore, **Kupiec *et al*. [12]** and **Mankikar *et al*. [13]** found no significant difference in heart rate between the two groups [p > 0.05].

Regarding VAS of pain, our findings revealed that VAS was significantly lower in Group 1 compared to Group 2 in all studied time intervals except baseline, while Group 3 had a higher VAS value. **Jadon *et al*. [10]** also demonstrated a significant difference in VAS scores across research groups at all times throughout first 24 hours. In addition, both groups had a considerable drop from baseline levels. Pain ratings at rest and during movement were considerably lower in study groups than in placebo group at all periods during research.

In addition, **Karatepe and Ozer [11]** reported that in group TAPB, VAS scores were significantly lower in entry time to recovery room, exit from it, and at postoperative 1st, 2nd, 3rd, 4th, 6th, and 12th h when compared to Group C. Furthermore, **Kupiec *et al*. [12]** observed that patients who got a TAP block had substantially lower VAS values three, six, and twelve hours after surgery. Furthermore, **Mankikar *et al*. [13]** found that VAS was measured at 2, 4, 6, 8, 12, 18, and 24 hours. When compared to patients who had a placebo block, VAS was lowered following TAP block with 0.5% ropivacaine during the first 8-10 hours post-operatively.

In terms of time to rescue analgesia, our findings revealed that the mean time to rescue analgesia in Group 3 was considerably shorter than in Groups 1 and 2. **Cansiz *et al*. [14]** also demonstrated longer time to rescue analgesia among TAP group compared to controls. **Mankikar *et al*. [13]** also observed that in TAP group, the time for rescue analgesia was increased from 4.1 to 9.53 h.

In terms of incidence of nausea and vomiting in analyzed groups, substantial difference between studied groups was found. The TAP group had a considerably reduced incidence. **Jadon *et al*. [10]** stated that nausea ratings were considerably lower in the TAP group, which corroborated our findings.

Cansiz *et al*. [14] demonstrated no significant difference between tested groups regarding nausea and vomiting. Furthermore, **McKeen *et al*.** [15] demonstrated no change in occurrence of nausea, vomiting, and pruritus. Furthermore, no problems or symptoms related to TAP block were identified by **Kupiec *et al*.** [12].

Current study was backed by **Wang *et al*.** [16]'s study, which covered 17 papers. USG-TAP block resulted in decreased cumulative opioid intake at 6 and 24 hours when in comparison with control groups [placebo or no blocks]. No significant differences in pain scores between dynamic and resting groups was observed. Patients in USG-TAP groups required more time for requesting their first analgesic and required less opioid rescue analgesia for severe pain over the course of 24 hours.

Baeriswyl *et al*. [17] reported that USG-TAP block provided modest postoperative analgesic effectiveness following abdominal laparotomy or laparoscopy and CS. Nevertheless, it has no further analgesic benefit in people who have also had spinal anesthesia with long-acting opioid. Minimum analgesic effectiveness is unaffected by injection time, technique, or the presence of postoperative.

Conclusion

USG bilateral TAP block reduces pain score, delays the first rescue analgesic requirement and reduces cumulative analgesic consumption in the postoperative period. Moreover, TAP block implementation has no negative effect on postoperative nausea, vomiting, sedation and hemodynamic parameters. USG-TAP block provided effective postoperative analgesia for patients undergoing CS under spinal anaesthesia and we believe that this technique improves patient satisfaction.

Limitations of the study

This study had some limitations: 1] the limited number of the sample size, 2] it is a single-center study, so, a larger sample size from a multicentric studies is warranted for more definitive decision on management.

Conflict of Interest and Financial Disclosure: None

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