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Effect of Intra-Ligamental Injection Before Removal of Spinal Needle After Spinal Anesthesia on Post Spinal Headache, no Injection Versus Normal Saline Versus Dexamethasone.

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ABSTRACT

Background: Among the most frequent side effects of spinal anesthesia is post-dural puncture headache (PDPH), which occurs in 1-40% of scenarios. In forty percent of cases, invasive treatment options such as epidural blood patches may be necessary, and it might result in significant comorbidity. The dural healing is facilitated by fibroblastic growth; this growth is thought to be enhanced by the damage to the surrounding tissues and the presence of a blood clot. Needle trauma, normal saline and dexamethasone all can produce local irritation that might enhance fibroblastic proliferation.

Aim of the study: Assessment of intra-ligamental injection of normal saline and dexamethasone on the incidence, duration and severity of post-spinal headache following spinal anesthesia.

Patients and Methods: 75 patients were randomly selected and enrolled into this study. They were divided into three equal groups; control group (C) received nothing, group (D) received dexamethasone, and group (N) received normal saline. After performing spinal block with heavy bupivacaine, in groups D and N the needle was withdrawn for about 0.5 cm to make sure the tip of the needle is in the interspinous ligament then either 1 ml of normal saline or 1 ml of dexamethasone solution was injected before complete removal of the needle. The incidence, severity, onset, and duration of PDPH were noted at 24 hours, 72 hours, and 7 days after spinal anesthesia. The meningeal headache index was used to grade the headache's severity.

Result: The incidence of PDPH through 1 week was 4 (16%) for both dexamethasone and the control group, and 2 (8%) for the normal saline group, with non-statistically significant differences (p-value more than 0.05). Additionally, there is no statistically significant difference in headache severity. The onset of headaches was delayed in the normal saline group compared with the control group, p-value less than 0.05. Duration of headache was comparable in the three-study group with a p-value of > 0.05.

Conclusion: Both normal saline and dexamethasone are not effective in the prevention of post-dural puncture headache after spinal anesthesia.

KEYWORDS: Spinal anesthesia, PDPH, normal saline, dexamethasone, onset, and duration.

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INTRODUCTION

Puncture of the dura may result in a post-dural puncture headache (PDPH). Post–dural puncture headache (PDPH) incidence is 0.5%–1% and is often higher in teaching hospitals. Typically, PDPH is bilateral, frontal retro-orbital, or occipital and extends into the neck. It may be throbbing or constant and associated with photophobia and nausea. The hallmark of PDPH is associated with body position.

The pain is aggravated by sitting or standing and relieved or decreased by lying flat. The onset of headache is usually 12–

72 hours following the procedure; however, it may be seen almost immediately. Untreated, the pain may last weeks, and in rare instances, has required surgical repair.[1]

PDPH is believed to result from leakage of CSF from a dural defect and intracranial hypotension. Loss of CSF at a rate faster than it can be produced causes traction on structures supporting the brain, particularly the meninges, dura, and tentorium. The incidence of PDPH is strongly related to needle size, needle type, and patient population. The larger the needle, the greater the likelihood of PDPH. Cutting-point needles are associated with a higher incidence of PDPH than pencil-point needles of the same gauge. Factors that increase the risk of PDPH include young age, female sex, and pregnancy. The lowest incidence would be expected in an elderly male using a 27-gauge pencil-point needle (<1%).[2]

A puncture of the dura may result in significant CSF leakage. Excessive CSF loss results in a discernible decrease in CSF volume and cerebral hypotension[3], especially when using needles greater than 25G.[4]

The history of dural puncture and the presence of a strong postural headache often make the diagnosis of post-dural puncture headache obvious. However, since severe cerebral disease might appear as a headache, following a dural puncture, it is essential to take into consideration other possible diagnosis. It is important for clinicians to keep in consideration that bridging dural veins may rupture due to intracranial hypotension and that a delay in diagnosis and treatment can be dangerous. Intracerebral tumors, intracranial hematomata, pituitary apoplexy, cerebral venous thromboses, migraine, chemical or infectious meningitis, and nonspecific headache are among the diagnoses that may appear as post-dural puncture headache. According to estimates, 39% of parturients have headache symptoms after delivery that are not connected to a dural puncture.[5]

The aim of the study

Assessment of intra-ligamental injection of normal saline and dexamethasone on the post-spinal headache following spinal anesthesia.

Patients and Methods

After obtaining approval from the local committee of the Scientific Council of Anesthesia & Intensive Care, Iraqi Board of Medical Specialization in Anesthesia & Intensive Care. In August 2023, 75 patients who were presented at either Al-Sader Teaching Hospital or Al-Najaf Teaching Hospital for lower limb or lower abdominal surgery under spinal anesthesia. All patients were given written informed consent before enrollment in this study.

Patients were randomly selected and allocated into three groups; group N received 1 ml of intra-ligamental normal saline, group D received 1 ml of intra-ligamental dexamethasone while group C received no injection. Normal saline and dexamethasone were injected intra-ligamental y after administration of spinal anesthetic.

All patients were requested to be fasting for 8-10 hrs. preoperatively. Before performing spinal anesthesia, patients were attached to standard monitoring such as pulse oximeter, ECG, NIBP, and temperature probe. Intravenous access was inserted with an 18-gage cannula and co-loading crystalloid fluid was administrated at 10 ml/kg/h.

Inclusion criteria

- Patients presented for lower abdominal surgery and lower limb surgery on elective bases.
- Patients' age 18-40 years.
- American Society of Anesthesia (ASA) either I or II.
- Body mass index (BMI) range 25-31 kg/m2.

Exclusion criteria

- Contra-indication to or refusal of spinal anesthesia.
- Pregnant women.
- Emergency surgery.
- History of headache disorder.

Spinal anesthesia was performed under a sterile technique in the sitting position. The midline approach at L3-L4 or L4-L5 intervertebral space was chosen.

With a 25G Quincke tip needle, the position of the needle was confirmed in the subarachnoid space by a gush of cerebrospinal fluid (CSF). Then, the predetermined dose of heavy bupivacaine 0.5% solution was injected. When the bupivacaine injection was completed, the spinal needle was withdrawn until the CSF disappeared, and then the needle was further withdrawn for about 0.5-1 cm to ensure that the needle tip was not in the epidural space but within the interspinous ligament. Next, 25 patients received 1 ml (4 mg) of dexamethasone injection (group D), 25 patients received 1 ml of normal saline injection (group N), and 25 patients received no injection (group C). Then, the needle was completely withdrawn and the patient lay in the supine position.

Intraoperative hemodynamic variables were monitored every 5 minutes, decreasing blood pressure by 20% from baseline was treated by IV bolus ephedrine 5-10 mg and bradycardia was treated with IV atropine 0.5 mg if heart rate below 60 b/min. Oxygen was administrated by a simple face mask as required.

After completion of surgery, the patients were referred to the recovery room then to the ward as usual. The patients were followed up for the development of headache.

After hospital discharge, the patients were followed up for the development of headache through phone calls at 24 hours, 3 days and 7 days after the surgical procedure. In the case of development of headache, the patients were invited to the out-patient clinic for full assessment, treatment and follow-up plans. The severity of headache score was assessed according to meningeal headache criteria.

The statistical software SPSS (version 26) was used for all data analyses. The mean ± standard deviations were used to express the measurement data. First, tests for homogeneity of variance and normal distribution were performed on all the

data. If the data were homogeneous in variance and had a normal distribution, the independent Samples test, ANOVA, and Chi-Square (X2) examined comparability between the two groups. Statistical significance was indicated by a p-value less than 0.05.

RESULTS

75 patients were randomly selected and allocated into three groups: C, D and N. They were all investigated further and given criteria. Patients' demographics are shown in table 3.1 including gender, age and ASA physical status showed no statistical difference among the study groups (p>0.05). BMI was statistically different among the three study groups with a p-value of less than 0.05.

Table 1: Demographic characteristics.

Characteristics		Group C	Group D	Group N	p-Value
Gender N.(%)	Male	14 (56%)	14 (56%)	15 (60%)	0.947
	Female	11 (44%)	11 (44%)	10 (40%)	
Age	Mean ± SD	26.5 ± 6.75	29.2 ± 8.33	29.8 ± 7.15	0.256
BMI	Mean ± SD	26.7 ±1.51	27.5 ± 1.78	28.34 ± 1.77	0.005
ASA N.(%)	ASA I	17 (68%)	18 (72%)	16 (64%)	0.832
	ASA II	8 (32%)	7 (28%)	9 (36%)	

The number and percentage of patients who developed PDPH at 24 hrs., 72 hrs., and 7 days after spinal anesthesia are shown in Table 3.2. There was no statistically significant difference among the three study groups C, D and N with a p-value of more than 0.05.

Table 2: Patients who developed headache at 24hrs, 72hrs and 7 days after spinal anesthesia.

	Group C	Group D	Group N	p-Value		
				C & D	C & N	D & N
< 24 hrs.	4/25 (16%)	4/25 (16%)	1/25 (4%)	-	0.157	0.157
24-72 hrs.	-	-	1/25 (4%)	-	-	-
3-7 days	-	-	-	-	-	-
Total N.	4/25 (16%)	4/25 (16%)	2/25 (8%)	-	0.384	0.384

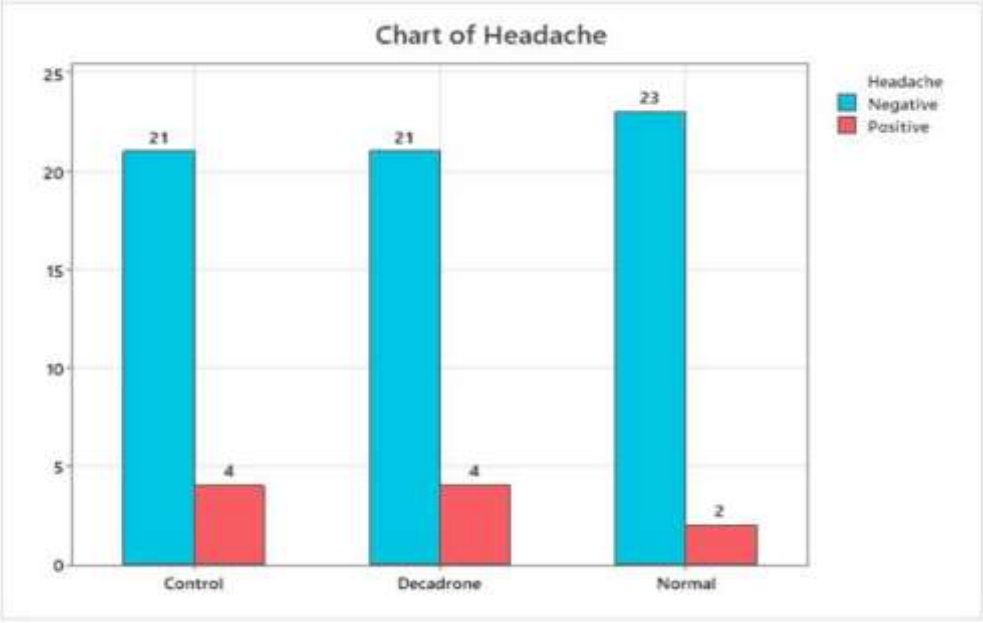

Figure 1: The incidence of headache among three study groups.

The severity of headache is shown in Table 3.3 and there was no statistically significant difference among the three study groups C, D and N with a p-value of more than 0.05.

Figure 3: The severity of headache among the three study groups.

Severity	Group C	Group D	Group N	p-Value		
				C & D	C & N	D & N
Mild N.	1	2	-	0.270	0.576	0.438
Moderate N.	3	1	1			
Severe N.	-	1	1			

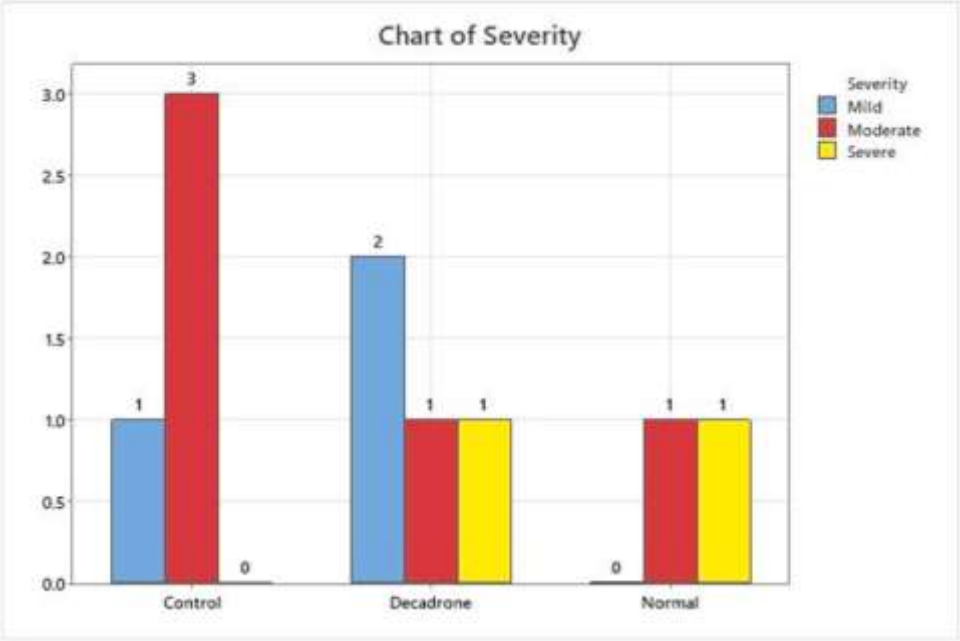

Figure 2: The severity of headache among three study groups.

The onset time of headache, as shown in table 4, was delayed in normal saline group (N) as compared with control group (C) with a statistically significant difference between the two groups (p. value < 0.05). Despite apparent difference that is observed between the normal saline group (N) and dexamethasone group (D), no significant statistical difference had been found (p. value of > 0.05).

Similarly, no statistically significant difference between groups C and D had been found (p. value of > 0.05).

Table 4: Comparison of the onset time of headache among the study groups.

	Group C	Group D	Group N	p-Value		
				C & D	C & D	C & D
Onset time mean ± SD(hrs.)	4.5±5.19	2.75±2.36	29.0±26.87	0.56	0.01	0.09

The duration of headache, as shown in Table 3.5, showed no statistically significant difference among the three study groups C, D and N (p-value > 0.05).

Table 5: Comparison of study groups according to the duration of headache.

	Group C	Group D	Group N	p-Value		
				C & D	C & D	C & D
Duration mean ± SD(days)	4.0±1.15	3.75±2.21	4.0±1.41	0.84	1.00	0.895

DISCUSSION

In this research, intra-ligamental injection of dexamethasone or normal saline was ineffective neither for the prevention of post-dural puncture headache nor to reduce its severity. The incidence of headache in our study was 16% for both control and dexamethasone groups and 8% for the normal saline group which is lower than that was reported by Weji et al (28.7%)[7] and Kassa et al (38.8%)[8], although they used the same gauge and type of spinal needle, this might be due to small sample size.

Currently, there is insufficient researches available that directly compare intra-ligamental injections of normal saline to steroids. Related researches, however, analyze how effectively these medications generally reduce PDPH symptoms.

The research reported by Baysinger et al[9], who discussed the injection of normal saline through the caudal epidural, compared to whole blood, normal saline was more likely to dissipate through tissue planes and reabsorb quickly.[10]

This technique could increase epidural and intrathecal pressures which reduce the leak and give time for dural repair. The saline may cause an inflammatory response in the epidural space, which would encourage the dural hole to close. In the current study, only 1 ml of normal saline was injected intra-ligamentally , which is lower than the previous research.

In the study reported by Atabak Najaf et al[11], who injected 2 ml (8 mg) of dexamethasone into the epidural space, they said that dexamethasone was not effective for the prevention of post-dural puncture headache, which is in line with our study. Our study differs in that, only 1 ml (4 mg) instead of 2 ml (8 mg) of dexamethasone was administered and intra-ligamental instead of epidural injection was used.

Similar to any pharmacologic study, the specific type of steroid being used, its dosage, the frequency of dosing, and the administration time, all have an important influence on the outcome. Dexamethasone is a non-particular steroid that cannot give a sustained anti-inflammatory effect; however, the higher solubility of dexamethasone is associated with a short duration of action when locally administered.

90 % of the post-dural puncture headaches normally started within 24-48 hrs.[12] and 72 hrs. reported by Leibold et al.[13] The mean onset time of PDPH in the current research was 4.5 hrs. in the control group, 2.7 hrs. in the dexamethasone group, and 29 hrs. in the normal saline group. Statistical analysis revealed significantly longer mean onset time of headache for group (N) than for group (C) but , surprisingly, this is not the case when comparing the mean onset time for group (N) with group (D) despite that the difference in the latter case is more !!, this might be due to the small sample size. In theory, local mechanical stretching of the tissues exerted by the normal saline injection[14] might have provided a temporary mechanical seal for the dural puncture that delayed CSF leak. Similarly, despite statically insignificant results, only 2 cases developed headache in the normal saline group (N) compared with the other two groups and this is an important 50% reduction in the incidence of PDPH. However, as statistical analysis showed significantly higher mean BMI for group (N) this might have a role in this finding as patients with higher BMI tend to have less incidence of PDPH.[15]

One might propose that particulate steroids would ultimately have been a better choice to achieve long-term therapeutic effects (headache avoidance). In the one study that is currently available, betamethasone was the only steroid utilized, indicating that an epidural injection of steroids for the prevention of headaches may have a favorable outcome.[16]

CONCLUSION

Our result concluded that, intra-ligamental injection of 1 ml of either normal saline or dexamethasone have no effect on the incidence or severity of post-dural puncture headache after spinal anesthesia for patients undergoing lower limb or lower abdominal surgery.

REFERENCES

I. Munnur U, Suresh S: Backache, headache, and neurological deficit after regional anesthesia. Anesthesiol Clin North Am 2003; 21:71.

II. Morgan & Mikhail's, Clinical Anesthesiology. Fifth edition. 2013 Page 969-970.

III. Grant R, Condon B, Hart I, Teasdale GM. Changes in intracranial CSF volume after lumbar puncture and their relationship to post-LP headache. J Neurol Neurosurg Psychiatry 1991; 54: 440-2.

IV. Ready LB, Cuplin S, Haschke RH, Nessly M. Spinal needle determinants of rate of transdural fluid leak. Anesth Analg 1989;69: 457-60.

V. D.K.Turnbull and D.B.Shepherd. Post-dural puncture headache:pathogenesis, prevention, and treatment. British Journal of Anaesthesia 91 (5):718-29 (2003).

VI. Azeez, S.A.S., AlMashhadani, M. and Saadoon, A. (2023) 'The Effect of height and weight adjusted dose of intrathecal hyperbaric bupivacaine for elective caesarean section', World Journal Of Advance Healthcare Research, 7(11), pp. 123–129.

VII. Weji, Bedilu Girma, et al."Incidence and risk factors of postdural puncture headache: prospective cohort study design." Perioperative Medicine 9 (2020):1-6.

VIII. Kassa AA, Beyen TK, Denu ZA. Post dural puncture headache (PDPH) and associated factors after spinal anesthesia among patients in University of Gondar Referral and Teaching Hospital, Gondar, North West Ethiopia; 2015.

IX. Baysinger CL, Menk EJ, Harte E, Middaugh R. The successful treatment of dural puncture headache after failed epidural blood patch. Anesth Analg 1986; 65:1242-4.

X. Morewood GH. A rational approach to the cause, prevention, and treatment of post-dural puncture headache. Can Med Assoc J 1993; 149: 1087-1094.

XI. Najafi, Atabak, et al."Is epidural dexamethasone effective in preventing post-dural puncture headache ?." Acta Anaesthesiologica Taiwanica 52.3 (2014):95-100.

XII. Reynolds F. Dural puncture and headache. Br Med J 1993; 306: 874-6.

XIII. Leibold RA, Yealy DM, Coppola M, Cantees KK. Post-dural puncture headache: characteristics, management, and prevention. Ann Emerg Med 1993; 22:1863±70.

XIV. Al-Hashel, J., Rady, A., Massoud, F. et al. Post-dural puncture headache: a prospective study on incidence, risk factors, and clinical characterization of 285 consecutive procedures. BMC Neurol 22, 261 (2022).

XV. De Matteis C, Pisana G. prevention of headache from spinal anesthesia with the use of epidural cortisone. Minerva Anestesiol 1991; 57:137e40.