Original Article

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Complete Bed Rest versus Early Ambulation After Spinal Anesthesia: A Nationwide Survey and a Single Center Case-Cohort Study of Post-Procedural Care Policy in Taiwan

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Objective: Post-dural puncture headache (PDPH) is a complication after spinal anesthesia (SA). Bed rest after SA is a common clinical practice to prevent the development of PDPH, but the prophylactic effects are not clinically substantial. This study compared the effects of early ambulation and prophylactic bed rest after spinal anesthesia, and surveyed the common care policy after spinal anesthesia in Taiwan.

Methods: We surveyed the post-procedural care policy for SA among 102 general hospitals in Taiwan. In April 2018, the nursing care policy after SA was altered from complete bed rest (up to 6 hours) to early ambulation (move freely on the bed) at our hospital. After propensity matching, a total of 568 patients who received SA before or after changing of postoperative care policy were included for analysis.

Results: Complete bed rest after SA is currently the standard postoperative care practice in 68.6% of hospitals in Taiwan. Most hospitals (41.4%) mandate complete bed rest for 8 hours after procedures. In our cohort study, 12 cases in the bed-rest group and 5 cases in the early-ambulation group developed PDPH after SA (4.2% vs. 1.8%; $p = 0.090$). Patients in the bed-rest group had significantly higher incidence of newly onset low back pain (11.2% vs. 6.0%; $p = 0.029$). The overall satisfaction of anesthesia was similar between the two groups.

Conclusions: In Taiwan, prophylactic bed rest remains a common clinical practice after SA. Our case-cohort study showed that prophylactic bed rest had no significant advantage regarding the prevention of PDPH after SA. In fact, prolonged bed rest increased low back strain. However, early ambulation after SA should be exercised under careful surveillance to prevent falls due to residual motor blockade.

Key words: spinal anesthesia, postdural puncture headache, postanesthesia care

Introduction

Postdural puncture headaches (PDPH) are relatively uncommon but important anesthesia-related complication. It has been

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suggested that PDPH is caused by a bimodal mechanism that involves decreased intracranial pressure and cerebral vasodilation after spinal anesthesia.[1,2] The reported overall incidence of PDPH after spinal anesthesia varies from 0.1 to 36%.[3,4] PDPH classically presents as frontal-occipital headache that commonly occurs within 24 hours after dural puncture, but can occur anytime within 7 days.[5] The headache worsens in the upright position and improves in the lying position. The risk factors for PDPH after spinal anesthesia include young age, female gender, obstetric patients, larger needle size, use of cutting needles, and multiple dural punctures.[6-8] A number of therapeutic approaches have been recommended for the prevention of PDPH after spinal anesthesia, such as hydration, prophylactic bed rest,[9] preadministration of intravenous aminophylline,[10] 5-HT3 receptor antagonists[11] and cosyntropin[12] as well as the use of atraumatic needles.[13] Among these prophylactic strategies, bed rest is the most commonly used clinical intervention for preventing PDPH after dural puncture,[2,14] as this approach is the most conservative and has very high clinical compliance. Since changes in posture can affect cerebrospinal fluid leakage and headache intensity, bed rest in the supine position is the recommended treatment for PDPH.[15] However, the prophylactic effects of routine bed rest in the development of PDPH after spinal anesthesia are questionable and did not show any beneficial effects according to recent systematic reviews.[14,16] The clinical practice of routine bed rest after subarachnoid puncture or spinal anesthesia was first introduced in 1898[17,18] and still remains a very common medical and nursing standard of care in Taiwan and other Asian countries.[19-21] Therefore, the aims of this study were to survey the post-procedural care practices for spinal anesthesia among the general hospitals in Taiwan and compare the occurrence of PDPH after changing the postoperative care policy for spinal anesthesia in our institute.

Materials and Methods

Nationwide survey of post-procedural care policy for spinal anesthesia in Taiwan

The study was approved by the ethics committee and the institutional review board of E-Da Hospital (Approval number EMRP-107-001). All tertiary and other regional (primary and secondary) hospitals with clinical anesthesia service in Taiwan were included in this survey. The post-procedural care policy for spinal anesthesia from each institute was collected from the nursing staff in the post-

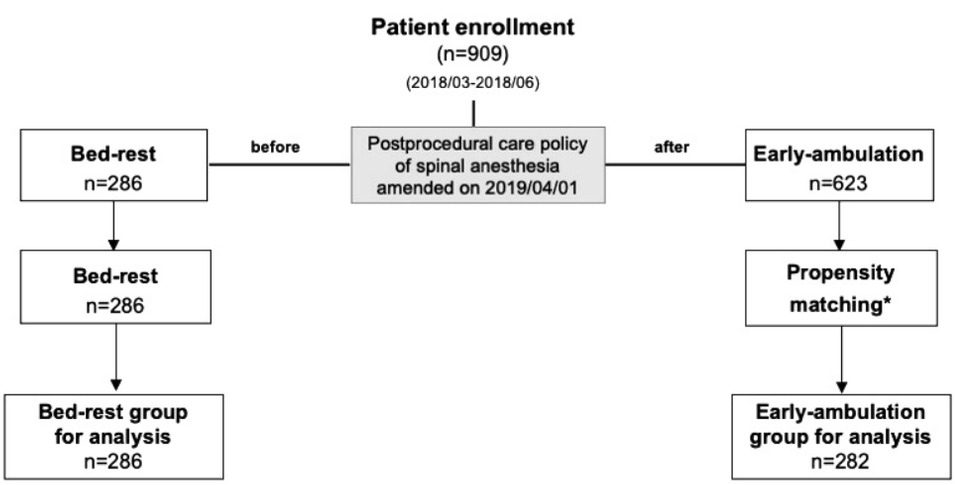

*Fig. 1 Case-controlled study flowchart. *Matching parameters included age, body mass index, gender, American Society of Anesthesiologists (ASA) physical status, operation types, operation time*

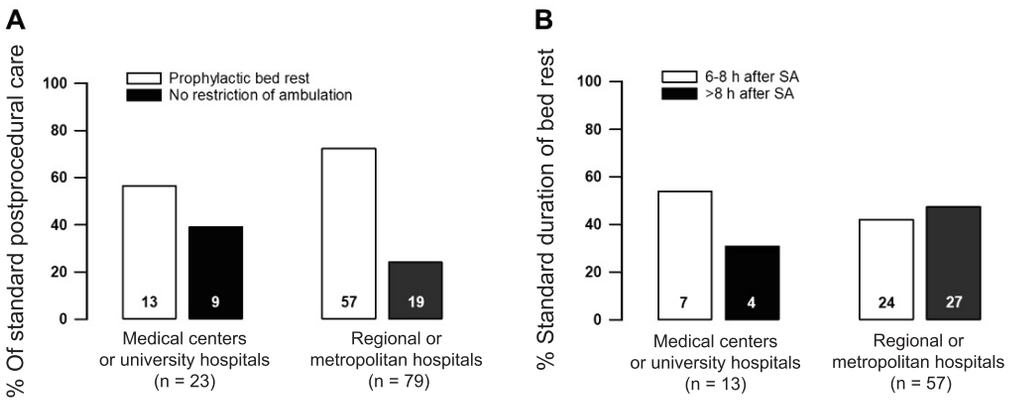

Fig. 2 (A) Post-anesthesia care policy in medical centers and regional hospitals. Three hospitals were not included (1 center and 2 regional hospitals), as there are no standard institutional care policies after spinal anesthesia. Data were analyzed by Chi-square between medical centers and regional hospitals, p = 0.145. (B) Time duration of bed rest in medical centers and regional hospitals. Eight hospitals (2 centers and 6 regional hospitals) were not included, as the durations of prophylactic bed rest after spinal anesthesia of these hospitals are less than 6 hours. Data were analyzed by Chi-square between medical centers and regional hospitals, p = 0.320. Numbers appear in the columns indicate the actual number of hospitals included for analysis.

anesthesia care unit (PACU) via telephone interviews from October 25, 2019 to October 29, 2019. Two questions were delivered during the interview:

1. Is routine prophylactic bed rest after spinal anesthesia the standard post-procedural care in your hospital?
2. If "yes" in question 1, please specify the duration of prophylactic bed rest after spinal anesthesia.

Case-cohort study of post-procedural care for spinal anesthesia

This study was approved by the ethics committee and the institutional review board of E-Da Hospital (Approval number EMRP-107-001). Written informed consent was waived by the committee as the study only collected general clinical data of in-hospital patients regardless of age and gender who received spinal anesthesia for surgical interventions and were admitted to PACU after surgery from March 19, 2018 to June 30, 2018. Patients who admitted to the intensive care unit for postoperative care were excluded from the analysis. Spinal anesthesia was performed by staff anesthesiologists using 26 or 27-gauge Quincke spinal needles. The anesthesia and surgical teams decided the levels of neuraxial block and intraoperative positioning in accordance with the anticipated operation time and surgical sites. Patients were visited at bedside within 24 hours after operation and all adverse events after spinal anesthesia were recorded by experienced PACU nurses.

The post-anesthesia care policy for spinal anesthesia at our hospital was revised on April 1, 2019. In accordance with the change in care policy, patients were grouped into the bed-rest group (i.e., routine prophylactic bed rest for 6 hours) and early-ambulation group (i.e., no ambulatory restriction after spinal anesthesia). This medical and nursing care policy after spinal anesthesia was applied to PACU and all medical wards and units. Propensity matching of the two study groups was based on the patients' age, body mass index (BMI), gender, American Society of Anesthesiologists (ASA) physical status, types of operation and operation time (Fig. 1). The occurrence of PDPH was defined as a newly developed headache after spinal anesthesia that increased in intensity in the upright position and was relieved by lying down.[17] The headache can occur with

Table 1. Patient demographical data and surgical factors.

Characteristics	Early-ambulation (n = 282)	Bed-rest (n = 286)	*p* value
Age (years)	61.4 ± 17.2	62 ± 16.1	0.747
ASA PS Class	2.1 ± 0.6	2.3 ± 0.6	0.067
Operation time (min)	69.7 ± 12.9	69.6 ± 11.5	0.540
BMI (kg/m^2)	25.5 ± 4.5	25.9 ± 5.0	0.302
Dose of intrathecal bupivacaine (mg)	11.2 ± 2.8	10.8 ± 3.3	0.006
Gender			
Female	183	171	0.209
Male	99	115	
Anesthesia level			0.571
Above T10	106	110	
T10 or below	134	154	
Surgery type			0.653
General and plastic surgery	72	73	
Colorectal surgery	21	25	
Urogenital surgery	94	88	
Orthopedic surgery	95	100	

ASA PS: American Society of Anesthesiologists physical status, BMI: body mass index, T10: dermatome level of thoracic 10. Data are presented as mean ± SD, and were analyzed by unpaired t-test or Ram-Sum test, as appropriate.

or without additional neurological symptoms such as neck stiffness, blurred vision, or tinnitus.[17] Back pain was defined as a newly developed discomfort or pain in the lower back region after spinal anesthesia with or without radiating symptoms. Back pain severity was assessed using a visual analogue scale (VAS) that ranged from 0 (no pain) to 10 (most severe pain).[19] The satisfaction of anesthesia service was evaluated by a 5-point Likert scale which categorized patient responses into dissatisfied, neutral, or satisfied.[22]

Statistical analysis

The values of continuous variables were compared using an independent two-sample t test or one-way ANOVA. Categorical variables were compared using chi-square or Fisher's exact test. The potential risk factors included patient demographics and clinical variables, such as patient age groups, BMI, gender, ASA physical status, types of surgery, and duration of operation. Statistical significance was accepted at a level of $p < 0.05$. All analyses were carried out using the SAS software, version 9.1 and the SPSS software, version 24.0 (IBM, Armonk, NY).

Results

Nationwide survey of post-spinal anesthesia care policy in Taiwan

A total of 102 tertiary or regional hospitals responded to the telephone survey (100% response rate), including 23 medical centers and 79 regional hospitals across all geographic regions of Taiwan. Routine bed rest in supine position after spinal anesthesia is currently the standard postoperative care practice in 68.6% (70/102) of these hospitals and there were no differences between medical centers and general hospitals (56% vs. 72%, respectively; $p = 0.145$) (Fig. 2A). Most hospitals (68.6%) that mandated routine post-procedural bed rest and confined patients to bed for 6 – 8 hours after spinal anesthesia (Fig. 2B). The policy of duration of bed rest was similar between the medical centers and regional hospitals ($p = 0.320$) (Fig. 2B).

Case-cohort analysis of PDPH in bed rest and ambulatory groups

A total of 909 patients received spinal anesthesia for surgical procedures during

the study period (Fig. 1). After propensity matching, 282 patients were included in the early-ambulation group and 286 patients were included in the bed-rest group (Fig. 1). Patient characteristic parameters are shown in Table 1. Seventeen patients developed PDPH after spinal anesthesia in this cohort study, resulting in an overall incidence of 2.99% for spinal headaches. Although more patients in the bed-rest group developed PDPH, the incidence were not statistically different between the two groups (4.2% vs. 1.8% for bed-rest vs early-ambulation group, $p = 0.090$) (Table 2). Symptoms of PDPH in these patients subsided within 3 days after conservative treatment, and none of these patients required further invasive management (e.g., epidural blood patching).

In patients who requested bed rest after spinal anesthesia, the occurrence of newly onset back pain was significantly higher than the early-ambulation group (11.2% vs. 6%, respectively; $p = 0.029$) with an adjusted odds ratio of 1.96 (95% CI: 1.064 – 3.625) (Table 2). Furthermore, the average postoperative VAS pain scores were higher in the bed-rest group (Table 2). In addition, patient satisfaction of anesthesia care was similar between the two groups (data not shown).

Discussion

Although systematic reviews and several evidence-based articles provide sufficient evidence that routine prophylactic bed rest after SA or dural puncture do not have any prophylactic effect against PDPH,[3,9,14,15,18] our nationwide survey of the postprocedural care policy for SA indicated that routine postprocedural bed rest for up to 8 hours remains a common practice among tertiary and regional hospitals in Taiwan. Our case-cohort observational study also found that routine bed rest after SA did not reduce the incidence of PDPH in comparison to early ambulation. In contrast, prolonged supine positioning significantly increased the risk of developing back strain in these patients.

The debate on the prophylactic effects of bed rest after lumbar puncture on PDPH started more than 30 years ago.[23] Bed rest in the supine position normalizes cerebral fluid (CSF) hydrostatic pressure in the spinal cord column. It was therefore theorized that prophylactic bed rest following dural puncture might reduce the leakage of CSF and prevent the development of PDPH. However, clinical studies suggested that the volume of CSF removed after dural puncture and CSF opening pressure did not affect the incidence and degree of postprocedural headache.[15] After an analysis of 12 clinical studies (a total of 2,477 participants), Areval-Rodriguez and colleagues found that bed rest was associated with a higher incidence of PDPH than immediate mobilization after lumbar puncture, with a relative risk of 1.16 (95% CI: 1.02 – 1.32).[14] Among the general population who received spinal anesthesia at our hospital, we found that the overall incidence of PDPH was 2.99%, which was similar

Table 2. Outcomes of postprocedural care after spinal anesthesia.

	Early-ambulation (n = 282)	Bed-rest (n = 286)	p^a	OR	p^b
PDPH	5 (1.8)	12 (4.2)	0.090	2.426	0.100
Low back pain	17 (6.0)	32 (11.2)	0.029	1.964	0.031
VAS of postoperative pain	0.6 ± 1.3	0.9 ± 1.6	0.004		

Data are presented as n (%) for postdural puncture headache (PDPH) and low back pain, and presented as mean ± SD for visual analogue scale (VAS). p^a value for chi-square test, p^b value for odds ratio (OR)

to that previously reported. Consistent with the findings of previous clinical observational studies and control trials,[4,14,19] our case-cohort demonstrated that prophylactic bed resting failed to reduce the incidence of PDPH in patients receiving spinal anesthesia. In fact, those previous studies also provided moderate-quality clinical evidence suggesting that bed rest compared to immediate mobilization can actually increase the overall incidence of non-specific post-procedural headache with a relative risk of 1.16 (95% CI: 1.02 – 1.32).[14,23] In addition to an increased incidence of post-procedural headaches, our observational study showed that patients who were assigned to the complete bed-rest group had a higher incidence of newly-developed low back pain during recovery from spinal anesthesia. The intensity of the low back pain in the bed-rest group was also significantly higher than that in the early ambulation group. Although our study did not find any significant differences in the postoperative patient satisfaction survey, the decreased overall incidence of postoperative headaches (PDPH and non-specific headache) and low back pain would reduce postoperative care burden for nursing and medical staff.

We undertook a nationwide telephone survey of the standard nursing care policy after spinal anesthesia at all tertiary and regional hospitals in Taiwan that regularly perform in-patient or out-patient surgical procedures. Among the 102 hospitals that responded to the telephone survey, the majority of medical institutes (68.6%) instruct routine postoperative bed rest for at least 6 hours in patients who received spinal anesthesia. To the best of our knowledge, this is the first large-scale, nationwide survey of spinal anesthesia postoperative care policy. Although there is still a lack of international consensuses on the necessity of bed rest after spinal anesthesia, the clinical evidence for routine practice of post-procedural bed rest is not substantial, and may potentially lead to additional adverse events, such as non-specific headache and low back pain. Therefore, it is necessary to reevaluate the standard institutional postoperative care policy for spinal anesthesia based on the currently available clinical evidence, particularly the practice on routine prophylactic bed rest.

This study has a number of limitations. First, the retrospective case-cohort study design was subjected to selection and diagnostic bias.[24] The patient populations who received spinal anesthesia could be different before and after the change in postprocedural care policy at our hospital, even after retrospective propensity matching of the two study groups. PDPH development was recorded by nurse anesthetists during the postoperative bedside visit within 24 hours after spinal anesthesia. The diagnosis of PDPH was based on the characteristic clinical symptoms and signs defined by the institutional quality assurance checklist. Therefore, it was possible that certain cases of PDPH with minor symptoms or less characteristic clinical presentations could have been underdiagnosed. Second, we used only 26G and 27G spinal needles for spinal anesthesia, which have been proven to be associated with a lower risk of PDPH.[25,26] However, our findings might not be extrapolated to other populations receiving dural puncture using needles of different sizes. Third, this study surveyed only the postoperative care protocol of spinal anesthesia at the tertiary and regional hospitals in Taiwan, but not individual anesthesiologists who actually managed the perioperative anesthesia care for patients. The staff anesthesiologists might have their own preference in patient care, including postprocedural treatment protocol (bed rest vs. early ambulation) after spinal anesthesia.

Conclusions

Our observational study supports the general clinical recommendation that prophylactic bed rest after spinal anesthesia does not reduce the incidence of PDPH. In fact,

prolonged confinement of the patient to bed increased the incidence of newly developed headache and low back pain. However, prophylactic bed rest remains a common clinical practice in postoperative care after spinal anesthesia in Taiwan. Therefore, appropriate revision of the institutional care policy after anesthesia is needed. Nevertheless, since early ambulation after neuraxial block may increase the risk of in-hospital falls, it requires careful surveillance to prevent falls due to residual motor blockade.

References

1. Turnbull DK, Shepherd DB: Post-dural puncture headache: pathogenesis, prevention and treatment. Br J Anaesth 2003;91:718-29. doi: 10.1093/bja/aeg231.
2. Kwak KH: Postdural puncture headache. Korean J Anesthesiol 2017;70:136-43. doi: 10.4097/kjae.2017.70.2.136.
3. Jabbari A, Alijanpour E, Mir M, et al: Post spinal puncture headache, an old problem and new concepts: review of articles about predisposing factors. Caspian J Intern Med 2013;4:595-602.
4. Bakshi SG, Gehdoo RSP: Incidence and management of post-dural puncture headache following spinal anaesthesia and accidental dural puncture from a non-obstetric hospital: A retrospective analysis. Indian J Anaesth 2018;62:881-6. doi: 10.4103/ija.IJA_354_18.
5. Choi PT, Galinski SE, Takeuchi L, et al: PDPH is a common complication of neuraxial blockade in parturients: a meta-analysis of obstetrical studies. Can J Anaesth 2003;50:460-9. doi: 10.1007/BF03021057.
6. Pirbudak L, Özcan HI, Tümtürk P: Postdural puncture headache: Incidence and predisposing factors in a university hospital. Agri 2019;31:1-8. doi: 10.5505/agri.2018.43925.
7. Peralta F, Devroe S: Any news on the postdural puncture headache front? Best Pract Res Clin Anaesthesiol 2017;31:35-47. doi: 10.1016/j.bpa.2017.04.002.
8. Gaiser RR: Postdural Puncture Headache: An Evidence-Based Approach. Anesthesiol Clin 2017;35:157-67. doi: 10.1016/j.anclin.2016.09.013.
9. Vilming ST, Schrader H, Monstad I: Post-lumbar-puncture headache: the significance of body posture. A controlled study of 300 patients. Cephalalgia 1988;8:75-8. doi: 10.1046/j.1468-2982.1988.0802075.x.
10. Yang CJ, Chen T, Ni X, et al: Effect of pre-administration with aminophylline on the occurrence of post-dural puncture headache in women undergoing caesarean section by combined spinal-epidural anaesthesia. J Int Med Res 2019;47:420-26. doi: 10.1177/0300060518803231.
11. Fattahi Z, Hadavi SM, Sahmeddini MA: Effect of ondansetron on post-dural puncture headache (PDPH) in parturients undergoing cesarean section: a double-blind randomized placebo-controlled study. J Anesth 2015;29:702-7. doi: 10.1007/s00540-015-2000-5.
12. Basurto Ona X, Uriona Tuma SM, Martinez Garcia L, et al: Drug therapy for preventing post-dural puncture headache. Cochrane Database Syst Rev 2013:CD001792. doi: 10.1002/14651858.CD001792.pub3.
13. Arevalo-Rodriguez I, Muñoz L, Godoy-Casasbuenas N, et al: Needle gauge and tip designs for preventing post-dural puncture headache (PDPH). Cochrane Database Syst Rev 2017;4:CD010807. doi: 10.1002/14651858.CD010807.pub2.
14. Arevalo-Rodriguez I, Ciapponi A, Roqué i Figuls M, et al: Posture and fluids for preventing post-dural puncture headache. Cochrane Database Syst Rev 2016;3:CD009199. doi: 10.1002/14651858.CD009199.pub3.
15. Ahmed SV, Jayawarna C, Jude E: Post lumbar puncture headache: diagnosis and management. Postgrad Med J 2006;82:713-6. doi: 10.1136/pgmj.2006.044792.
16. Park S, Kim K, Park M, et al: Effect of 24-hour bed rest versus early Ambulation on headache after spinal anesthesia: systematic review and meta-analysis. Pain Manag Nurs 2018;19:267-76. doi: 10.1016/j.pmn.2017.10.012.
17. Thornberry EA, Thomas TA: Posture and post-spinal headache. A controlled trial in 80 obstetric patients. Br J Anaesth 1988;60:195-7. doi: 10.1093/bja/60.2.195.
18. Destrebecq A, Terzoni S, Sala E: Post-lumbar puncture headache: a review of issues for nursing practice. J Neurosci Nurs 2014;46:180-6. doi: 10.1097/JNN.0000000000000052.
19. Choi JS, Chang SJ: A Comparison of the incidence of post-dural puncture headache and backache after spinal anesthesia: a pragmatic randomized controlled trial. Worldviews Evid Based Nurs 2018;15:45-53. doi: 10.1111/wvn.12236.
20. Wani M, Qazi M, Baba B, et al: Effect of pillows and mobilisation in the development of post-dural-puncture headaches: a comparative study. Asian Pac J Health Sci 2015;2:6-9. doi: 10.21276/apjhs.2015.2.3.2.
21. Li J, Li X, Tong X, et al: Investigation of the optimal duration of bed rest in the supine position to reduce complications after lumbar puncture combined with intrathecal chemotherapy: a multicenter prospective randomized controlled trial. Support Care Cancer 2018;26:2995-3002. doi: 10.1007/s00520-018-4142-0.
22. Pini A, Sarafis P, Malliarou M, et al: Assessment

of patient satisfaction of the quality of health care provided by outpatient services of an oncology hospital. Glob J Health Sci 2014;6:196-203. doi: 10.5539/gjhs.v6n5p196.
23. Carbaat PA, van Crevel H: Lumbar puncture headache: controlled study on the preventive effect of 24 hours' bed rest. Lancet 1981;2:1133-5. doi: 10.1016/S0140-6736(81)90586-9.
24. Nohr EA, Liew Z: How to investigate and adjust for selection bias in cohort studies. Acta Obstet Gynecol Scand 2018;97:407-16. doi: 10.1111/aogs.13319.
25. Babu DD, Chandar DD, Prakash CS, et al: Evaluation of post dural puncture headache using various sizes of spinal needles. Int J Sci Stud 2015;3:9-13. doi: 10.17354/ijss/2015/545.
26. Lotfy Mohammed E, El Shal SM, et al: Efficacy of different size Quincke spinal needles in reduction of incidenceof Post-Dural Puncture Headache (PDPH) in Caesarean Section (CS). Randomized controlled study. Egyptian J Anaesth 2017;33:53-8. doi: 10.1016/j.egja.2016.10.011.