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ORIGINAL RESEARCH

A survey of post-dural puncture headache management practices within a South African academic department

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Background: Post-dural puncture headache (PDPH) is a common consequence of neuraxial anaesthesia; especially among parturients, in whom it is associated with maternal morbidity, prolonged hospital stay and increased healthcare costs. Although international guidelines are available for PDPH management, variable management practices exist. There are no published studies which document current practices, or available guidelines, with respect to PDPH management in South Africa. This study aimed to describe PDPH management practices within the University of the Witwatersrand (Wits) Department of Anaesthesiology, which may assist in future local guideline or protocol development.

Methods: An electronic questionnaire was distributed to the Wits Department of Anaesthesiology. The survey instrument was developed following a literature review targeting recent evidence-based PDPH management guidelines, including the United Kingdom-based Obstetric Anaesthetists' Association (OAA) guidelines from 2018. Thereafter it was reviewed for content and face validity. Participant responses were compared to the OAA guidelines, which were considered the standard of practice. A related score was determined and correlations with demographic variables were assessed.

Results: Participants' practice with respect to conservative management strategies and the performance of epidural blood patches (EBPs) was in keeping with the OAA guidelines. This is despite a lack of available departmental guidelines and limited provider experience with performing these procedures. Of the participants, 96% perceived they would benefit from the institution of formal guidelines.

Conclusion: PDPH management practices among anaesthetists within the Wits circuit are variable. Despite limited experience in treating PDPH, these practices are generally consistent with current international guidelines. The development and institution of formal guidelines for the management of PDPH are recommended, as well as continuing medical education of staff, to improve patient outcomes.

Keywords: epidural, post-dural puncture headache, anaesthetist, guidelines

Introduction

A post-dural puncture headache (PDPH) is defined by the International Headache Society as a headache occurring within five days of a lumbar puncture, which is caused by cerebrospinal fluid leakage through the dura and is usually accompanied by neck stiffness and/or subjective hearing problems.[1] PDPH is a common consequence of neuraxial anaesthesia for labour and/or caesarean section with an overall incidence of approximately 1%, but it could be as high as 88% after accidental dural puncture (ADP) during the performance of epidural anaesthesia with the use of a 16 G Tuohy needle.[2,3] It typically resolves spontaneously within two weeks, or after the administration of an epidural blood patch (EBP).[1]

PDPH is associated with morbidity and mortality, especially in the obstetric patient population in whom neuraxial procedures are commonly performed. The effects of PDPH can be debilitating and result in poor maternal–infant bonding, decreased ambulation, increased duration of hospital stay, recurrent hospital visits and increased hospital costs.[3] There is also an association with chronic headache, and with subdural haemorrhage in rare cases, which can result from tearing of the intracerebral bridging veins secondary to significant intracranial hypotension.[4]

Available literature on South African academic hospitals suggests that the rate of PDPH following labour epidural anaesthesia may be two to three times higher than that of high-income countries.[5] This may be related to low labour epidural rates (approximately 2% compared to 23–60% in high-income countries such as the UK and USA) and poor skill development.[5,6] A study performed at a South African academic hospital auditing labour epidural practice indicated that no EBPs were performed for the treatment of PDPH during a period of one year, despite this being considered the gold standard of treatment.[5,7]

Internationally, there are published practice-based surveys which have evaluated countries, including Israel, the UK and the USA. These studies demonstrate that there is wide variation in the management of PDPH.[8-12] There is little consensus with regards to the best approach to managing PDPH, and much of the existing advice is 'based on very little robust scientific evidence'.[7] Guidelines for the management of PDPH in the setting of obstetrics have been put forward by the Obstetric Anaesthetists' Association (OAA) in 2018 and there are also recently published

Australian guidelines from 2017, both of which are based on a review of the literature and expert opinion.[7,13]

At present, neither have guidelines been endorsed by the South African Society of Anaesthesiologists (SASA), nor has a protocol or guideline been recommended by the University of the Witwatersrand (Wits) Department of Anaesthesiology.

There are no published studies which document current management practices with respect to PDPH in South Africa, and the management of PDPH by South African anaesthetists may be different from international practice, due to limitations relating to infrastructure and staffing. Management practices of the Wits Department of Anaesthesiology are also unknown. Therefore, this study aims to describe the management practices of PDPH by anaesthetists at Wits, which may assist the development of local management guidelines or clinical pathways.

Methods

An exploratory survey was performed using a self-administered questionnaire. The survey instrument was developed following a literature review targeting the most recent evidence-based PDPH management guidelines, particularly those from the OAA. Thereafter it was assessed for content and face validity by 10 qualified anaesthetists with an interest in obstetric/regional anaesthesia. The survey consists of 40 questions subdivided into seven sections (Appendix 1).

Institutional ethics approval was obtained and permission was given by the relevant authorities. Thereafter, the voluntary and anonymous questionnaire was electronically distributed by email, using the REDCap platform (Research Electronic Data Capture, https://www.project-redcap.org/), to all members of the Wits Department of Anaesthesiology on three different occasions. The department comprises 214 anaesthetists: 58 consultants, 12 career medical officers, 102 registrars and 42 medical officers.

Table I: Demographic characteristics of participants

Characteristic	*n* (%)
Age in years	***n* = 140**
25–29	16 (11%)
30–39	94 (67%)
40–49	18 (13%)
50–59	8 (6%)
≥ 60	4 (3%)
Gender	***n* = 139**
Male	53 (38%)
Female	86 (61%)
Years of anaesthesia experience	***n* = 140**
< 1 year	1 (1%)
1–2 years	19 (14%)
3–5 years	60 (43%)
6–9 years	31 (22%)
≥ 10 years	29 (21%)
Rank	***n* = 140**
Medical officer	16 (11%)
Junior registrar – 1st and 2nd year	30 (21%)
Senior registrar – 3rd, 4th and subsequent years	53 (38%)
Consultant (includes career medical officers who have > 10 years of experience)	41 (29%)

Statistical methods

It was estimated that a minimum response rate of 138 (66%) was required, based on a margin of error of 5%, a confidence level of 95% and a response distribution of 50%. Data were downloaded from REDCap into a Microsoft Excel spreadsheet (Microsoft, Redmond, WA). Categorical variables were summarised as frequencies and percentages, and continuous variables as median and interquartile range. The chi-square test was performed for inter-variable comparison.

Results were then compared to the OAA guideline recommendations and an additional score relating to 'correct practice' was given. Points were allocated to various questions and certain responses were indicated as being correct or incorrect based on their compatibility with the 2018 OAA guidelines. These were given points of 1 or 0, respectively. Only questions where the anaesthetist had a degree of choice/control over the result were included in this series (Questions 17, 19, 22–24, 26–33, 35–37, 39; Appendix 2). The incorporated questions totalled 37 points, and a score of equal to or more than 26 points (70%) was deemed to be associated with 'correct practice'. This score was determined and validated by the modified Angoff method in consultation with 10 qualified anaesthetists. A comparison between 'correct practice' and the demographic section variables was performed with the use of the chi-square test to assess for correlation. A p-value < 0.05 was considered statistically significant.

Calculation of the Cronbach's alpha, as an index of reliability for the questions included in the assessment of correct practice, was performed. The calculated Cronbach's alpha for the survey questions included in the assessment of 'correct practice' was 0.65, demonstrating an acceptable reliability.[14] Analysis was performed using using Statistica™ (TIBCO Software Inc., Palo Alto, CA) and STATA™ (StataCorp, College Station, TX) software.

Results

The response rate for the survey was 68% (145/214). A total of 140 surveys were included, since five had missing data. The demographic data of respondent anaesthetists are presented in Table I.

In total, 79% of participants (109/138) were unaware of guidelines for the management of PDPH and 96% of participants (134/139) perceived that they would benefit from the institution of formal guidelines. The participants' responses with respect to the follow-up of neuraxial anaesthesia and accidental dural puncture are presented in Table II.

Table II: Follow-up of neuraxial anaesthesia and accidental dural puncture

Follow-up of patients who receive neuraxial anaesthesia, the day after the procedure was performed	
Spinal anaesthesia	***n* = 140**
Always	3 (2%)
Often	7 (5%)
Rarely	80 (57%)
Never	50 (36%)
Epidural anaesthesia	***n* = 139**
Always	52 (37%)
Often	44 (32%)
Rarely	29 (21%)
Never	14 (10%)
Reasons for failure of follow-up	***n* = 126**
Logistically not feasible	78 (62%)
Someone else will report PDPH to me	29 (23%)
I do not have time	15 (12%)
Not concerned about PDPH	2 (2%)
Other	2 (2%)
Previously performed an epidural where ADP has occurred	***n* = 139**
Yes	65 (47%)
No	69 (50%)
Never performed an epidural	5 (4%)
Initial management of ADP	***n* = 139**
Remove needle and try at another level	97 (70%)
Abandon procedure	29 (21%)
Prophylactic epidural blood patch	3 (2%)
Feed catheter intrathecally and use in intrathecal space	8 (6%)
Prophylactic epidural saline	2 (1%)
Follow-up of patients when ADP has occurred	***n* = 138**
Yes	119 (86%)
No	15 (11%)
Never performed an epidural	4 (3%)

PDPH – post-dural puncture headache, ADP – accidental dural puncture

In all, 34% of participants (47/140) indicated that they had never been involved in the management of a patient with PDPH and 56% (77/138) felt that they had insufficient knowledge and expertise to manage a patient with PDPH. The general and conservative PDPH management practices of participants are detailed in Table III and Table IV. Please note that these tables include a description of management of PDPH which may be theoretical, since some participants have not been directly involved in managing this condition.

The participants' preferred management practices with respect to the performance of EBPs are detailed in Table V. Of the registrars and medical officers, 88% (89/101) indicated that they would be supervised during the performance of an EBP, while 57% (79/138) indicated that they had no experience in performing a repeat EBP.

Table III: General principles of management of post-dural puncture headache

How would participants become aware of a patient with suspected PDPH (multiple options could be selected)	***n* = 140**
Informed by a member of the obstetric team	117 (84%)
Informed by ward nursing staff	21 (15%)
Become aware during follow-up themselves	27 (19%)
Report from another anaesthetist	43 (31%)
Other	9 (6%)
Actions that would be taken on the first day of management in a patient with suspected PDPH (multiple options could be selected)	***n* = 140**
History and examination	135 (96%)
Monitor and review of the patient's temperature	106 (76%)
Blood tests	58 (41%)
Computed tomography scan	2 (1%)
Conservative management (intravenous fluids, analgesia, bed rest)	136 (97%)
Sphenopalatine ganglion block	10 (7%)
Epidural blood patch	5 (4%)
Physician/neurology consult	5 (4%)
Other	6 (4%)
Blood tests that would be ordered during the initial work-up of PDPH patients (multiple options could be selected)	***n* = 140**
None	37 (26%)
Full blood count	98 (70%)
Urea and electrolytes	48 (34%)
C-reactive protein	82 (59%)
Blood culture	22 (16%)
Other	4 (3%)

PDPH – post-dural puncture headache

In terms of other possible treatment modalities that participants could use as part of their management strategy, only 9% of participants (12/138) indicated they had previously performed a sphenopalatine ganglion block (SPGB), and two-thirds of these participants (8/12) had performed between two to five SPGBs.

Regarding assessment for 'correct practice', 94% (132/140) of anaesthetists who were surveyed obtained a score of ≥ 70% by selecting options which were aligned with the OAA management guidelines. There was no statistically significant association between any of the demographic characteristics and knowledge of correct practice (Table VI).

Discussion

This study focuses on PDPH management practices in South Africa. The results show that while 94% of participants had scores which were considered to reflect 'correct practice' in terms of the OAA guidelines, more than 78% were unaware of any PDPH management guidelines. Almost all participants indicated that they would benefit from the implementation of guidelines. More than half of the anaesthetists surveyed felt that they had

Table IV: Conservative management strategies

Prescription of oral fluids	***n* = 127**
Yes	117 (92%)
No	10 (8%)
Prescription of intravenous fluids	***n* = 127**
Yes	102 (80%)
No	25 (20%)
Prescription of bed rest	***n* = 138**
Yes	126 (91%)
No	12 (8%)
Medication prescribed for PDPH (multiple options could be selected)	***n* = 140**
Paracetamol	138 (99%)
Nonsteroidal anti-inflammatory drugs	103 (74%)
Opioids	40 (29%)
Caffeine	125 (89%)
Gabapentinoids	5 (4%)
Other	1 (1%)
Duration of time that conservative management is employed	***n* = 140**
< 24 hours	21 (15%)
24–48 hours	108 (77%)
49–72 hours	9 (6%)
> 72 hours	1 (1%)
No conservative management – immediate performance of an EBP	1 (1%)
Next step taken if conservative management fails	***n* = 139**
Epidural blood patch	125 (90%)
Sphenopalatine ganglion block	13 (9%)
Epidural patch with other substances	1 (1%)
Greater occipital nerve block	0 (0%)

PDPH – post-dural puncture headache, EBP – epidural blood patch

Table V: Participant experience and management of epidural blood patch

Number of EBPs previously performed	***n* = 140**
0	77 (55%)
1	25 (18%)
2–5	29 (21%)
≥ 6	8 (6%)
Complications relating to EBP about which participants are routinely counselled (multiple options could be selected)	***n* = 140**
Infection	127 (91%)
Repeat dural puncture	92 (66%)
Spinal haematoma ± paralysis	70 (50%)
Backache	113 (81%)
Nerve damage	66 (47%)
Failure of EBP	121 (86%)
Obtain written consent for the EBP	***n* = 139**
Yes	128 (92%)
Locations in which EBPs are performed	***n* = 139**
Minor procedure room	38 (27%)
Operating theatre	83 (60%)
Ward	17 (12%)
Other	1 (1%)
Monitors routinely applied when performing an EBP (multiple options could be selected)	***n* = 140**
Electrocardiogram	123 (88%)
Non-invasive blood pressure	136 (97%)
Pulse oximetry	135 (96%)
Individual responsible for drawing the sterile blood for EBP	***n* = 139**
Fellow anaesthetist	116 (83%)
Participant	15 (11%)
Surgeon	1 (1%)
Nurse	1 (1%)
Other	6 (4%)

EBP – epidural blood patch

Table VI: Factors associated with correct practice

Variable	**Categories**	**Correct practice *n* (%)**	**Incorrect practice *n* (%)**	***p*-value**
Age (*n* = 140)	25–29	16 (12%)	0 (0%)	0.70
	30–39	87 (66%)	7 (88%)	
	40–49	17 (13%)	1 (12%)	
	> 50	12 (9%)	0 (0%)	
Total		132 (100%)	8 (100%)	
Gender (*n* = 139)	Male	82 (63%)	4 (50%)	0.48
	Female	49 (37%)	4 (50%)	
Total		131 (100%)	8 (100%)	
Years of anaesthesia experience (*n* = 140)	< 3 years	18 (14%)	2 (25%)	0.18
	3–5 years	58 (44%)	2 (25%)	
	6–9 years	27 (20%)	4 (50%)	
	≥ 10 years	29 (22%)	0 (0%)	
Total		132 (100%)	8 (100%)	
Rank (*n* = 140)	Medical officer	16 (12%)	0 (0%)	0.17
	Junior registrar	26 (20%)	4 (50%)	
	Senior registrar	50 (38%)	3 (38%)	
	Specialist	40 (30%)	1 (12%)	
Total		132 (100%)	8 (100%)	

insufficient knowledge or expertise to manage a patient with PDPH appropriately. The desire for guidelines may therefore reflect poor levels of confidence in staff members regarding PDPH management; which may be the result of inexperience, since more than a third of the participants had never managed PDPH and more than half had never performed an EBP.

The low levels of performance of EBP and practical experience may relate to low labour epidural rates in Gauteng and the associated lower number of ADPs, despite South Africa having a two to three times higher rate of PDPH following labour epidurals compared to high-income countries.[5,6] Data from a study by Jacobs-Martin et al.[5] showed that there was a 2.2% epidural rate at Tygerberg Hospital which manages approximately 7 000 deliveries per annum, with five PDPHs occurring in one year, but no EBPs performed as part of management. This is in contrast with other countries such as the USA, where an average of approximately 30 EBPs may be done at one institution per year, in a centre that has approximately 6 300 deliveries per annum, with a 57.5% epidural rate.[15]

For those participants who had done EBPs, only 6% had performed more than five EBPs, the majority of whom were consultants. Practical competency, with a 90% success rate when performing regional techniques such as spinal and epidural anaesthesia, requires a minimum of 45–60 procedures to be performed.[16] While clinical experience in the performance of epidurals would likely lend a degree of competence to EBP performance, there is increased complexity with the performance of an EBP, and a minimum number required for competency may be difficult to determine. Of the registrars who participated, 12% stated that they would not be supervised when performing an EBP. This practice is contrary to the recommendation made by the OAA guidelines, and has the potential to put patients at higher risk of morbidity.[17]

Contrary to both the OAA and South Australian Perinatal Practice Guidelines (SAPPG) recommendations, most study participants indicated that written information regarding PDPH, as well as its treatment options, were not provided to the great majority of patients.[7,13]

This may highlight a shortcoming in our system, since the availability of written information for patients has the potential to improve knowledge, confidence, satisfaction, adherence to recommended care, as well as doctor-patient communication scores.[18-20]

The results of this study also show a lack of patient follow-up after neuraxial procedures, including those with ADP. This is most concerning as ADP is the largest risk factor for PDPH development.[4] Poor follow-up is contrary to the OAA guidelines and could result in cases of PDPH being overlooked, which may result in poor patient satisfaction, increased morbidity, and mortality in rare cases.[7,21]

The most common reason cited for lack of follow-up of patients receiving neuraxial blocks was logistics (62%); this requires further investigation to establish what the specific organisational issues are, and to develop and implement better management practices. This, coupled with the large proportion of participants indicating that they were unaware of a mechanism for reporting PDPH, would likely result in inadequate identification of patients with PDPH. This is in keeping with a study conducted in Israel, in which patients with PDPH were most often identified by a member of the obstetrics team rather than by an anaesthetist.[10] Such a lack of follow-up and reporting may contribute to the lower rates of PDPH management in our setting.

In general, the findings pertaining to conservative management of PDPH were in keeping with the OAA guidelines. Most anaesthetists surveyed would provide oral and intravenous fluids, where the OAA guidelines advise the maintenance of normal hydration.[7] Also, similarly to the situation in other countries, most participating anaesthetists would prescribe simple analgesia and nonsteroidal anti-inflammatory drugs, whereas few opted for gabapentinoids or other medications not presently supported by the OAA guidelines.[7,9,11,22]

OAA guidelines recommend caffeine prescription, since it has shown benefit. The rate of caffeine prescription in this study is similar to that noted in a North American survey, but more than double that noted in a UK survey.[7,9,11] Compared with North American anaesthetists, more practitioners in our survey advised bed rest, but the recommended duration was variable.[9] This is at odds with the OAA guidelines, which state that while many women gain transient relief from bed rest, prolonged bed rest is not recommended as this may increase the risk of venous thromboembolism.[7]

In addition, as in findings from Israeli, UK and Nordic surveys, most anaesthetists in our survey (90%) would perform an EBP in the event of failed conservative management, after 24–48 hours.[10,11,22] This is in contrast with the findings of the North American survey by Baysinger et al.,[9] which indicated that 81% of participants would perform an EBP within 24 hours, likely due to a perception that 'conservative measures were largely ineffective'. This differs from the OAA recommendations, which specify that patients should be informed that treating PDPH with an EBP is associated with a lower efficacy and a higher need for repeat patch if performed within the first 48 hours of ADP.[7]

Of note, a small percentage of participants (9%) would perform SPGB, instead of EBP, as the next step if conservative management failed. Although this is not supported by the current OAA guidelines, SPGB has been shown to have efficacy in treating PDPH in case reports and case series as either a temporary method of pain relief or a curative treatment.[23,24] In a resource-poor environment where theatre time is in high demand, a relatively quick, easy, safe and inexpensive technique such as this may need to be considered.[23,24] It could also be an option for patients who decline or have contraindications to EBP, which is in keeping with the SAPPG recommendations.[13] However, further high-level evidence is required to establish the efficacy of this treatment if it is to be included in local guidelines.

Regarding the use of EBP, it is concerning that while 92% of participants said they would obtain written consent, about half would not counsel patients about the risks of repeat dural puncture, the risks of haematoma and paralysis, and the risk of nerve damage. This is necessary as part of appropriate informed consent, as per the Health Professions Council of South Africa's good practice guidelines.[25] The Medical Protection Society has stated that 'the presence of a signed consent form does not in itself prove valid consent to treatment; the important factors will always be the quality, extent and accuracy of the information given beforehand'.[26] The current practice of informed consent is inadequate and thus increases the risk of potential litigation.[27]

In terms of the performance site for the intervention, 60% of anaesthetists in this study would perform an EBP in theatre, which is similar to the results from Baraz and Collis[11] in the UK, but differs from a Turkish study by Gunyadin et al.,[28] which cited the most frequent location as the recovery room. In this study, monitoring, sterility, assistance during the EBP procedure, as well as volume of blood injected, were generally in keeping with the OAA guidelines as well as studies from the USA, but different from a study from Turkey, which reported lower use of monitors.[7-9,28] The most frequently cited volume of blood for injection during the EBP procedure was 20 ml, which is similar to the results from studies performed in Israel, Turkey and North America.[8-10,28]

Reported indications in our study for imaging of the brain and spinal cord were variable, but consensus was achieved on focal signs, decreased level of consciousness, and signs and symptoms suggestive of meningitis (see supplementary Table I). However, other accepted indications, such as tinnitus/vertigo and a failed repeat EBP, were not commonly selected, despite being indicated as part of the OAA guidelines. Other intracranial pathology could thus be missed, leading to associated morbidity and mortality.[7,21,27] Although the OAA does not recommend imaging after a failed first blood patch, 42% of participants in our study selected this option and a further 21% indicated that they would request imaging if symptoms did not resolve after two days of conservative management. These practices would result in inappropriate use of a limited resource. A protocol with indications for imaging may be beneficial to ensure correct patient care and use of scarce resources.

Most anaesthetists did not follow up on patients with PDPH after discharge, despite recommendations in the OAA guidelines.[7] This also contrasts with the findings from a UK study, where 56% of patients were followed up after discharge.[11] The institution of departmental guidelines may assist, by detailing a follow-up protocol.[18,19]

Internationally, there is variable access to and application of guidelines, with a written policy for PDPH management available in 85% of UK maternity units, 42% of institutions within Nordic countries, and 8–14% in various North American institutions.[8,9,11,12,22] There have been significant changes noted in the management of various aspects of ADP and PDPH between 1993 and 2005 in UK surveys, which have been attributed to the implementation of guidelines.[11] These changes are in keeping with newer recommendations regarding the use of intrathecal catheters, timing of conservative management, and performance of EBP.[7,13]

Many of the international studies detailing PDPH management practices have recommended the creation of guidelines for PDPH management.[8-12] Guidelines have been shown to improve patient outcomes, result in standardisation of patient care, and promote distributive justice.[29,30] At present, the 2018 OAA guidelines represent the most recent evidence-based recommendations for PDPH management; however, specific South African guidelines are required to ensure best practice based on available local resources, as well as practitioner and patient management preferences.

Study limitations

This study is contextual in nature and the results represent only the practice of Wits anaesthetists at the time of data collection. The findings cannot be generalised to other departments or institutions. Also, the primary objective of this study was to describe management practices for PDPH, and the questionnaire was primarily designed for this purpose. The study was not principally designed to investigate or report on the objective of 'correct practice' or to assess competence. Therefore, results relating to 'correct practice' should be interpreted in this context.

Conclusion

There are currently no guidelines pertaining to the management of PDPH in the context of obstetric anaesthesia practice in South Africa. Most anaesthetists surveyed reported correct practice with regards to PDPH management compared to the OAA guidelines. Confidence levels regarding PDPH management were poor in more than half the anaesthetists surveyed, which may reflect the lack of clinical experience among participants. Most anaesthetists perceived that they would benefit from the implementation of guidelines. The development and institution of formal guidelines to assist in the management of PDPH, as well as continuing medical education of staff with respect to the content of such protocols, is recommended, to increase the likelihood of good patient outcomes.

Conflict of interest

The authors declare no conflict of interest. This research was done in partial fulfilment of a Masters of Medicine degree.

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Ethical approval

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Appendices available online.