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Te Kaporeihana Āwhina Hunga Whara

Third Occipital Nerve Block: evidence based review

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Executive Summary

Background

Third occipital nerve blocks may be used as a diagnostic tool in the investigation of cervical headache following whiplash in adults. This review is intended to be a pragmatic assessment of the best available evidence published since the 2005 recommendations were released.

Methodology

Studies since 2005 were identified via a comprehensive database search, selected according to stated criteria and were critically appraised using the SIGN levels of evidence model.

Findings

Two randomized controlled trials (RCT) were included in the critical appraisal. One RCT investigated the effectiveness of the third occipital nerve block as a diagnostic tool using ultrasound, not fluoroscopy, to guide the needle. The other RCT compared ultrasound against fluoroscopy, with no placebo.

Conclusions

The evidence for third occipital nerve block has increased since 2005, though the numbers of studies are still small. The new studies support third occipital nerve blocks as a diagnostic tool in the investigation of cervical headache.

Recommendations

It is recommended from this analysis of the evidence presented in academic-based literature since 2005 that the recommendations on the third occipital nerve block do not need to change. The recommendation remains as:

> *"Third occipital nerve blocks may be used in the investigation of cervical headache following whiplash in adults. Double-blind, comparative blocks should be used as there is a high false-positive rate associated with single diagnostic blocks."*

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Important note

- *The purpose of this report is to outline and interpret the best current evidence for the effectiveness of third occipital nerve block in the diagnosis of third occipital nerve headache.*

- *It is not intended to replace clinical judgement or be used as a clinical protocol.*

- *A reasonable attempt has been made to find and review papers relevant to the focus of this report, however, it does not claim to be exhaustive.*

- *This document has been prepared by the staff of the Evidence Based Healthcare Team, ACC Research. The content does not necessarily represent the official view of ACC or represent ACC policy.*

- *This report is based upon information supplied up to the end of January 2016.*

1 Background

1.1 Objective of this review

The objective is to update ACC's current recommendations on third occipital nerve block as a diagnostic tool, which were released in 2005 as part of the online Interventional Pain Management (IPM) guidance.

The research question this review aims to answer is:

- What is the evidence for the effectiveness of third occipital nerve block in diagnosing cervicogenical headache in adults?

This review is intended to be a pragmatic assessment of the best available evidence published since the 2005 recommendations were released. The updated evidence based recommendations will be used to support ACC clinical advisors in making decisions about managing clients with persistent pain.

1.2 ACC's current position on third occipital nerve block

The clinical practice recommendation given for third occipital nerve block is:

> *"Third occipital nerve blocks may be used in the investigation of cervical headache following whiplash in adults. Double-blind, comparative blocks should be used as there is a high false-positive rate associated with single diagnostic blocks."*

The recommendation was graded as 'C' meaning the recommendation was supported by expert opinion only.

Third occipital nerve block is purchased using ACC service code 'IN42'.

1.3 Description of third occipital nerve block

The third occipital nerve innervates both the C2-3 zygapophyseal and the suboccipital area (lower back of the head). Third occipital headache is referred pain originating the C2-3 zygapophyseal joint[1].

Among patients with a whiplash injury, third occipital headache has a prevalence of 27% and can be as high as 53% in patients where the headache is the predominant complaint from the whiplash[2]. As chronic headaches and neck pain following whiplash can be caused by nerves other than the third occipital nerve (eg the greater occipital), a nerve block is required to diagnose what nerve the pain is originating to ensure the correct nerve is treated.

A third occipital nerve block is performed by doctors with specialist training in the procedure. This would most likely be a pain specialist, musculoskeletal physician, anesthetist, or radiologist. During the procedure the patient lies on their side and a fine needle is carefully inserted into the side of the neck and placed closed to the C2-C3 joint under x-ray guidance. The standardised method reported by the 2015 Practice Guidelines for Spinal Diagnostic and Treatment Procedures from the International Spine Intervention Society (ISIS)[1] involves injection of the three target points that correspond to the possible location of the third occipital nerve with 0.3mL of local anesthetic. A second confirmatory block is recommended to be performed on a different day to minimize the chance of obtaining a false-positive response. Third occipital nerve involvement is confirmed if the headache/pain is relieved, if not then the patient may have several different contributors to their pain.

2 Methods

2.1 Search Strategy

A search of the following databases was conducted in January 2015:

- Cochrane Library
- Embase
- Medline
- Pre-Medline
- Trip database

Auto alerts were run on Medline and Embase to ensure that studies added to the databases whilst the review was in progress were picked up until January 2016. See the Appendix (section 7.1) for the search strategy. A search was also carried out looking at if other workers compensation schemes funded third occipital nerve block but no information was found.

2.2 Inclusion and Exclusion Criteria

2.2.1 Inclusion Criteria

- Types of studies: Studies since 2005, randomised controlled trials (RCTs), clinical guidelines
- Types of participant: Adults with persistent neck or back pain of cervical facet joint origin
- Types of interventions: Third occipital nerve block

2.2.2 Exclusion Criteria

- Studies only available in abstract form, eg Conference presentations
- Studies not mentioning third occipital nerve block in method or results

2.3 Level of Evidence

Studies meeting the criteria for inclusion in this report were assessed for their methodological quality using the Scottish Intercollegiate Guideline Network (SIGN) level of evidence system[+] (Table 1).

Table 1. SIGN Criteria	
1++	High quality meta analyses, systematic reviews of randomised controlled trials (RCTs), or RCTs with a very low risk of bias
1+	Well conducted meta analyses, systematic reviews of RCTs, or RCTs with a low risk of bias
1-	Meta analyses, systematic reviews of RCTs, or RCTs with a high risk of bias
2++	High quality systematic reviews of case-control or cohort studies High quality case-control or cohort studies with a very low risk of confounding, bias, or chance and a high probability that the relationship is causal
2+	Well conducted case control or cohort studies with a low risk of confounding, bias, or chance and a moderate probability that the relationship is causal
2-	Case control or cohort studies with a high risk of confounding, bias, or chance and a significant risk that the relationship is not causal
3	Non-analytic studies, e.g. Case reports, case series
4	Expert opinion

[+] Scottish Intercollegiate Guidelines Network http://www.sign.ac.uk/

3 Findings

3.1 Evidence

3.1.1 Study selection

The initial electronic search identified 27 references. After review of the full text, 25 articles were excluded as they did not meet the inclusion criteria. This left two eligible RCTs that are included in this report.

3.1.2 Quality Assessment

One RCT (1-) has been published since 2006 looking at third occipital nerve block vs a control[3].

One RCT (1+) comparing different third occipital nerve block techniques is also included[4].

For more detailed analysis please refer to the evidence tables in the Appendix (7.3).

3.1.3 Third occipital nerve block as a diagnostic tool

Prior to 2005, evidence that third occipital nerve blocks have diagnostic utility for the diagnosis of cervical headache in adults following whiplash came from a single RCT[2] published in 1994. This study used repeated fluoroscopic screening to carry out the block.

Eichenberger et al, 2006[3] investigated using ultrasound, not fluoroscopy, to guide the third occipital nerve block. The RCT study carried out third occipital nerve blocks on both sides of the neck of 11 healthy paid volunteers, resulting in 21 injections (a small subcutaneous hematoma formed during one injection preventing the injection from occurring due to being unable to clearly identify the third occipital nerve). The injections were carried out using cervical ultrasound to identify the third occipital nerve. The study was double-blinded, with 10 cases receiving local anaesthetic (lidocaine) and 11 cases receiving saline. Nine of the ten injection cases with the local anaesthetic resulted in a successful block (anaesthesia in the skin area innervated by the third occipital nerve) compared to the 10 cases with a control (saline). There was one unsuccessful anaesthetic block, which was thought to be due to either inadvertent vascular update of the anaesthetic or spread of the anaesthetic away from the nerve.

3.1.4 Additional findings

Finalyson et al, 2013[4] carried out a RCT on patients undergoing third occipital nerve block comparing the performance of two guidance methods: ultrasound guided and fluoroscopy guided, with the fluoroscopy method being the control. The study measured how effective either method was by measuring needle incisions and the time taken for the injection. Pain relief from the block was a secondary measure and determined by electrical perceptual threshold (EPT). The block delivered using ultrasound was found to be more effective; it was faster and required fewer injections than delivery using fluoroscopy. Both reduced the pain reported by the patient using a numerical rating scale (0=no pain; 10 = worst imaginable pain) by 60%.

EPT measurements were undertaken before and after the block for both methods. EPT measures the sensory threshold of the nerves. The EPT ratio (blocked/unblocked) increased post-block, which was correlated with the sense of numbness. No placebo group was used so the RCT was unable to rule out a placebo effect on the pain reduction. The study also looked at the distribution of sensory changes, with all patients presenting hypoesthesia

(reduced sense of touch) in the suboccipital area. Most patients received hypoesthesia in areas associated with the greater occipital nerve, with the authors stating that this supports the cadaver studies showing multiple interconnections between the third and greater occipital nerve.

3.2 Publications not included in the critical appraisal

The 2013 Practice Guidelines for Spinal Diagnostic and Treatment Procedures from the International Spine Intervention Society (ISIS)[1] recommend using fluoroscopy guided third occipital nerve block on patients that satisfy the clinical features of probable cervicogenic headache (Table 2). This guideline was not included in the critical appraisal as it provided insufficient information about its development methods.

Table 2. Diagnostic criteria for probable cervicogenic headache[1]

1. Unilateral headache
2. Pain starting in the neck
3. Plus any three of:
    a. Pain trigged by:
        i. Neck movement or sustained awkward posture, and/or
        ii. External pressure of the posterior neck or occipital region
    b. Ipsilateral neck, shoulder, and arm pain
    c. Reduced range of motion of the neck
    d. Pain episodes of varying duration or fluctuating continuous pain
    e. Moderate, non-excruciating pain, usually of a non-throbbing nature
    f. Neck trauma a relative short time prior to onset.

4 Discussion

4.1 Nature and quality of the evidence

Two RCTs were looked at in this review and graded using the SIGN criteria (Table 1). Only one compared the third occipital nerve block with a control. While it provided a good analysis of the results, the study is limited by a low sample and the use of only descriptive statistics.

The RCT that compared fluoroscopy and ultrasound provided good analysis of the two different procedures and had a low risk of bias. However, it is primarily focused on the performance of carrying out the third occipital nerve blocks with different procedures and had no placebo.

4.2 Limitations

The number of studies published on third occipital nerve block as a diagnostic tool for investigating cervical headaches is very small: there have only been two RCTs comparing it with a control, and only one of these has been published since 2005.

The new RCT had a very small sample size with only 11 healthy volunteers receiving an injection of an anesthetic or control. No information was provided on how long the block lasts.

5 Conclusion

5.1 Evidence statement

The published evidence for third occipital nerve block as a diagnostic tool has increased since 2005 but is still dependent on a small number of RCTs. None of these RCTs reported any evidence that indicates that third occipital nerve blocks do not block the third occipital nerve.

There is some evidence from one RCT that ultrasound is associated with improved efficiency in carrying out the block.

5.2 Implications for practice and purchasing

The additional evidence has no implication on current practice for purchasing third occipital nerve block. The pain management contract does not distinguish between using an ultrasound or fluoroscopy guided third occipital neve block.

5.3 Recommendations based on available evidence

The 2005 recommendations on the third occipital nerve block do not need to change and should remain as:

Third occipital nerve blocks may be used in the investigation of cervical headache following whiplash in adults. Double-blind, comparative blocks should be used as there is a high false-positive rate associated with single diagnostic blocks.

6 References

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7 Appendices

7.1 Search Strategy

Medline and Embase databases via the Ovid platform:

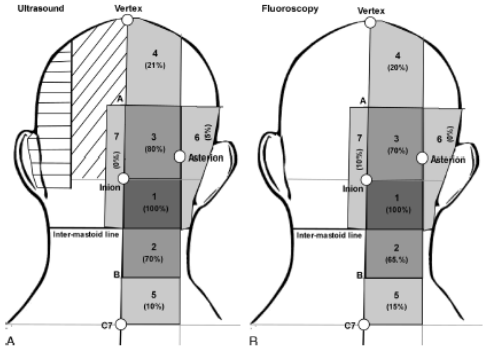
1. exp pain/
2. pain$.mp.
3. analg$.mp.
4. exp analgesia/
5. exp analgesics/
6. or/1-5
7. case stud$.pt.
8. case ser$.pt.
9. case series.pt.
10. case series.tw.
11. case series/
12. case series.mp.
13. case stud$.tw.
14. or/7-13
15. randomized controlled trial.pt.
16. controlled clinical trial.pt.
17. randomized controlled trials/
18. random allocation/
19. double-blind method/
20. single-blind method/
21. or/15-20
22. clinical trial.pt.
23. exp clinical trial/
24. (clin$ adj25 trial$).tw.
25. ((singl$ or doubl$ or tripl$ or trebl$) adj25 (blind$ or mask$)).tw.
26. placebos/
27. placebo$.tw.
28. random$.tw.
29. research design/
30. or/22-29
31. (clinical adj3 stud$).mp.
32. (systematic adj3 review$).mp.
33. (meta adj3 analysis).mp.
34. or/31-33
35. treatment outcome/
36. meta-analysis/
37. exp guideline/
38. or/35-37
39. 14 or 21 or 30 or 34 or 38
40. 39 and 6
41. *Catheter Ablation/
42. exp *Denervation/
43. exp rhizotomy/ or Pulsed Radiofrequency Treatment/
44. ((rf$ or prf or radiofrequency) adj3 (ablat$ or neuroablat$ or neuroblat$ or neurotomy or denervat$ or rhizotomy or neurolyis)).mp.
45. prfn.mp.
46. thermal coagulation.mp.
47. (thermal$ adj2 coagulat$).mp.
48. or/41-47
49. exp Zygapophyseal Joint/ or exp Lumbar Vertebrae/
50. Back Pain/ or Chronic Pain/
51. (lumbar adj2 medial).tw.
52. exp Whiplash Injuries/ or exp Neck Pain/ or exp Cervical Vertebrae/ or exp Median Neuropathy/ or exp Pain Management/
53. (cervical adj2 medial).tw.
54. ((occipital adj2 nerve$) or (third adj2 occipital) or "3rd occipital").tw.
55. (spine or spinal or back or neck or lumbar or cervical or whiplash or headache or occipital).mp.
56. or/49-55
57. 40 and 48 and 56

7.2 Excluded studies

Study	Topic	Reason
Adams et al, 2014[5]	Cranial neuralgia and chronic post-traumatic headaches with pulsed radio-frequency ablation of the left supraorbital, auriculotemporal, and greater and lesser occipital nerves: a case report	Abstract Block is of the greater occipital nerve.
Agarwal et al, 2010[6]	Efficacy of Local Anaesthetic Blocks and Pulsed Radiofrequency Lesioning for Occipital Neuralgia	Abstract. Nerve diagnostic block carried out on not listed.
Ducic et al, 2009[7]	Indications and Outcomes for Surgical Treatment of Patients with Chronic Migraine Headaches Caused by Occipital Neuralgia	Block is of the greater and lesser occipital nerve
Ducic et al, 2014[8]	A systemic review of peripheral nerve interventional treatments for chronic headaches	No third occipital nerve block.
Gaberhelik et al, 2011[9]	Pulsed Radiofrequency Therapy versus Greater Occipital Nerve Block in the Management of Refractory Cervicogenic Headache – A pilot study	Block is of the greater occipital nerve.
Gazelka et al, 2014[10]	Incidence of neuropathetic pain after radiofrequency denervation of the third occipital nerve	No third occipital nerve block.
Giblin et al, 2014[11]	Headache Plus: Trigeminal and Autonomic Features in a Case of Cerviogenic Headache Responsive to Third Occipital Nerve Radiofrequency Ablation	Case Study
Govind et al, 2003 [12]	Radiofrequency neurotomy for the treatment of third occipital headache	Study is looking at radiofrequency neurotomy. Third occipital nerve block is used to identify study population. Effectivness/accuracy of block not addressed.
Hamer et al, 2013[13]	Response to Cervicogenic Headaches and Occipital Neuralgia to Radiofrequency Ablation of the C2 Dorsal Root Ganglion and/or Third Occipital Nerve	Third occipital nerve block mentioned in methods but not in results or discussion.
Haspeslagh et al, 2006[14]	Randomised controlled trial of cervical radiofrequency lesions as a treatment for cervicogenic headache	Block is of the greater occipital nerve
Huang et al, 2012[15]	Occipital Nerve Pulsed Radiofrequency Treatment: A multi-Centre Study Evaluating Predictors of Outcome	Block is of the greater occipital nerve
Kent et al, [16]	Occipital nerve Radiofrequency Ablation for Occipital Neuralgia in a Pregnant Woman: A Case Report	No block occurred, only mentioned in description
Knievel et al,[17]	Incidence of third occipital neuralgia following radiofrequency denervation of the C2-3 facet joint	Poster Abstract. No block occurred.
Majors et al, 2012 [18]	Retrospective Chart Review: Predicative Outcome Measures in Fluoroscopically guided third occipital nerve blocks in preparation for neurolysis procedural planning in migraine treatment.	Poster Abstract
Naja et al, 2006[19]	Repetitive Occipital Nerve Blockade for Cervicogenic Headache: Expanded Case report of 47 Adults	Block is of the greater and lesser occipital nerve
Navani et al, 2006[20]	A case of pulsed radiofrequency lesioning for occipital neuralgia	Block is of the greater occipital nerve.
Rohof et al, 2012[21]	Headache: Pharmacological against interventional treatment. Interventional management of headache	Abstract No block mentioned

Sahai-Srivastava & Subhani et al, 2010[22]	Adverse effect profile or Lidocaine injections for occipital nerve block in occipital neuralgia	Block is of the greater occipital nerve
Schwedt et al, 2007[23]	Response to occipital nerve block is not useful in predicting efficacy of occipital nerve stimulation	Block is of the greater and lesser occipital nerve
Stall, 2013[24]	Non-invasive Pulsed Radio Frequency Energy in the treatment of Occipital Neuralgia with Chronic, Debilitating Headache: A report of four cases	Block is of the greater and lesser occipital nerve
Stoker et al, 2013	Dropped head syndrome after multilevel cervical radiofrequency ablation: A case report	Case study
Tepper et al, 2013[25]	Cluster Headache: Potential Options for Medically Refractory Patients (When all else fails)	Block is of the greater and lesser occipital nerve. Focuses on treatment.
Tobin & Flitman, 2009[26]	Occipital Nerve Blocks: When and What to inject	Third occipital nerve not mentioned
Vanelderen et al, [27]	Occipital Neuralgia	Third occipital nerve not mentioned
Wellens et al, 2014[28]	The effect of pulsed radiofrequency treatment for occipital neuralgia on brain-derived neurotrophic factor concentrations in blood	Abstract. Nerve diagnostic block carried out on not listed.

7.3 Evidence tables

Study	Methodology	Outcomes & results	Paper grading[1]		ACC reviewer comments & evidence level
Reference: Finlayson et al, 2013[3] **Study design:** Individual randomized, observer-blinded control trail **Research question:** What are the differences in success rates between ultrasound (US) - and Fluoroscopy (Flu) - guided third occipital nerve blocks (third occipital nerve block)?	<u>Population Demographics</u> N=43 patients undergoing third occipital nerve block. Recruited. <u>Inclusion criteria</u> Pain in the area delimited rostrally by the external occipital protuberance and caudally by an imaginary line joining the lower poles of the 2 mastoid processes, tenderness over the C2-C3 joint; duration of symptoms 6+ months <u>Exclusion criteria</u> Preexisting hypoesthesia in the suboccipital region (3 patients), coagulopathy, infection at the proposed puncture site, pregnancy, and allergy to local anaesthetic or iodinated contrast agents. <u>Blocking</u> 0.9 ml of local anaesthetic/radiographic contrast	**TABLE 1.** Patient Characteristics **Ultrasound (n = 20)** / **Fluoroscopy (n = 20)** / ***P*** Age, mean (SD), y: 54.90 (15.17) / 50.30 (14.50) / 0.333 Sex, male/female, n: 6/15 / 7/14 / 0.723 BMI, mean (SD), kg/m^2: 25.94 (5.46) / 27.46 (4.69) / 0.351 Pain numerical rating scale score preblock, median (range): 6 (3–9) / 6 (2–10) / 0.721  FIGURE 4. Sensory distribution of the TONBs: (panel A) US group n = 19, (panel B) fluoroscopy group n = 20. No statistical difference was found between the 2 groups. Zones are numbered 1 to 7; percentage in brackets represents the proportion of patients with hypoesthesia in at least half that zone; A is the midpoint between the inion and the vertex; B is the midpoint between the intermastoid line and the dorsal process of C7. The left side of panel A also contains an approximation of the sensory distribution of the GON (oblique pattern) and lesser occipital nerve (horizontal pattern).	An appropriate and clearly focused question.	Y	Is a comparison between methodologies. FLU is control. Moderate sample size. Study provides evidence for both US and FLU. Results continue to support third occipital nerve block as a diagnostic tool.
			Assignment of subjects to treatment groups is randomized	Y	
			Adequate concealment method is used	Y	
			Subject and investigators are kept blind about treatment allocation	Y	
			Treatment and control groups are similar at the start of the trial.	Y	
			The only difference between groups is the treatment under investigation	Y	
			Dropout rate	0%	
			All subjects analyzed in the groups to which they were randomly allocated	Y	

[1] Y = yes, N = no, NA = not applicable, ? = can't say (information is missing or unclear)

Funding:	Procedure Randomisation using computer. FLU (n=20) US (n=20). US: single injection guided by US. FLU: Three sights targeted, single skin puncture, 0.3 ml per target. Radiograph analysed by single blinded observer. Performance time measured as FLU: interval between first radiograph image and end of third target injection. US: contact of US probe to skin and end of injection. Outcome Measures Performance time & needle passes (1 needle insertion = 1 needle pass) by non-blinded observer not involved in patient care. Contrast of injection covering C2-C3. Sensory testing: pinprick, response to cold, electrical perceptual threshold (EPT) on both suboccipital areas. Carried out by blinded observer 30 minutes after third occipital nerve block. Posterior surface of neck and head divided into 7 zones on each side of midline. Success if hypoesthesia in at least 1 zone. Patients rated suboccipital pain on 0 (no pain) – 10 (worst, imaginable pain) scale immediately before and 30 minutes after third occipital nerve block.	TABLE 2. Results |	Ultrasound (n = 20)	Fluoroscopy (n = 20)	P
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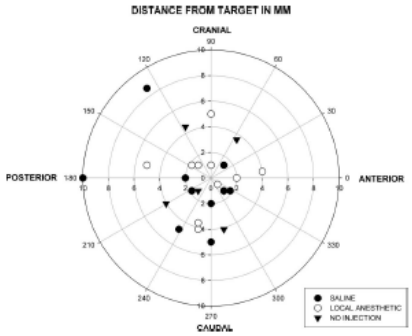
Success rate, %	95	100	1.000
Vascular puncture, %	0	10	0.487
Intra-articular spread, %	0	15	0.231
Needle passes, median (range)	2 (1–3)	6 (4–10)	0.000
Performance time, mean (SD), s	212.80 (60.93)	396.50 (97.44)	0.000
Pain NRS post-block Median (range)	2 (0–7)	2 (0–9)	0.602
Percentage relief from preblock pain, %	61.03 (SD, 32.88)	59.56 (SD, 24.10)	0.873
EPT ratio blocked/unblocked side	2.56 (SD, 1.42)*	2.04 (SD, 0.79)	0.163 | *n = 19 for the EPT ratio in the US group.	Results are comparable for all sites	NA	
				Results directly applicable to the patient group targeted by this population	Y	

	Statistics: Pilot study indicated 20 patients per group to show reduction in 25% performance time with alpha error of 0.05 and beta error of 0.02 Student t test. Continuous data assessed for normality with Kolmogorov-Smirnov test then student t-test. Non-normal distribution + ordinal data: Mann-Whitney U test. Categorical data: Pearson X2 test + Fisher test (count < 5). < 0.05 considered significant. All p are two-sided.	In US, 1 patient no sensory evidence of third occipital nerve block. Same results with FLU. Hypothesis: anatomical variant third occipital nerve block did not originate from C3 level. Success rate of third occipital nerve block 75% in 20% patients with third occipital nerve block not visualised by US. Advise effects Patient Follow up at 30 days no instance of infection, hematoma, third occipital nerve block injury. In conclusion, FLU and US guidance provide similar success rates for third occipital nerve block. Ultrasonography is associated with improved efficiency (decreased performance time, fewer needle passes).			
Reference: Eichenberger et al, 2006 **Study Design:** Double-blinded randomised placebo-controlled trail **Research question**: Can the third occipital nerve be visualized and blocked with the use of an ultrasound-guided	Population Demographics 14 healthy paid volunteers (10 female 4 male). Median Age 28.4 (21.4 – 44.6 yr). Median BMI 21.6 (21.4 – 44). 3 volunteers pilot for needle placement. No solution injected but ultrasound performed. 11 volunteers randomised (drawing lots) to receive local anaesthetic or normal saline. Exclusion Criteria Age less than 18 or greater than 70 History of alcohol abuse or psychotropic drugs, intake of nonsteroidal anti-inflammatory	Third occipital nerve block successfully visualised in 27 of 28 cases. In 1 case, C3-4 joint mistaken for C2-3 joint. Adverse effects In 1 case formation of small subcutaneous hematoma reduced sonographic resolution. 21 injections analysed. Main Findings Lignocaine 9/10 cases anaesthesia occurred. Spread of local anaesthetic away from nerve is an explanation or inadvertent vascular update an explanation for unsuccessful block. Saline 0/11 cases anaesthesia occurred. 2 saline injections occurred over 8 mm from target point 23/28 needle placement within defined maximal 5-mm	An appropriate and clearly focused question. Assignment of subjects to treatment groups is randomized Adequate concealment method is used Subject and investigators are kept blind about treatment allocation Treatment and control groups are similar at the start of the trail. The only difference between groups is the treatment under investigation	Y Y Y Y ? Y	Small sample size. No information on recruitment and inclusion criteria. Limited population characteristics. third occipital nerve block block can be performed using an ultrasound-guided technique. Injection of anaesthetic at third occipital nerve block causes anaesthesia of skin area

technique	drugs, coagulation abnormalities, history of coronary artery disease, allergy to local anaesthetics, possible pregnancy, bacterial infection, fever of unknown origin. <u>Inclusion Criteria</u> Not stated. <u>Block</u> 0.9 ml lidocaine (Xylocaine®), 2%. Prepared by person who did not performed injection. <u>Procedure</u> Third occipital nerve block identified using ultrasound. Needle advanced under ultrasound guidance. Plain radiographs of needle position using fluoroscopy. Injection performed on one side of neck and then the other side four hours later. <u>Outcome Measures</u> Distance between needle tip and middle C2-C3 zygapophysial joint. Pinpricking and cold testing of small skin region over rostral end of neck and the occiput below the external occipital protuberance. Blockade successful if anaesthesia in these areas 30 min after injection. <u>Statistics</u> Descriptive statistics.	distance from target point. 2 saline injections occurred over 8 mm from target point, as no blocks occurred this far unknown if block this far would have worked.  Fig. 4. The graph shows the position of the needle tips in relation to the target point confirmed by fluoroscopy, which is represented in the center of the graph. Distances along the vertical and horizontal axes are given in millimeters. The case in which we did not target the right joint and the case with subcutaneous hematoma formation are not included.	Dropout rate	0%	innervated by third occipital nerve block , therefore blocking third occipital nerve block.
			All subjects analyzed in the groups to which they were randomly allocated	NA	
			Results are comparable for all sites	NA	
			Results directly applicable to the patient group targeted by this population	?	