Prevalence and management of intrathecal morphine-induced pruritus in New Zealand Māori healthcare recipients

British Journal of Pain
2018, Vol 12(1) 20–25
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DOI: 10.1177/2049463717719773
journals.sagepub.com/home/bjp

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Abstract

Aims and objectives: The aim of this article was to determine whether the incidence of intrathecal morphine-induced pruritus (ITMI) was influenced by ethnicity, age or gender in relation to orthopaedic versus caesarean surgeries.

Background: The use of intrathecal morphine for patients undergoing total hip and knee joint replacements and for lower segment caesarean sections (LSCS) has gained popularity worldwide since its introduction over 30 years ago. Several international studies show that morphine delivered via the intrathecal route is an effective and safe method of pain relief. However, while the beneficial effects of intrathecal morphine have been clearly documented in many studies, so also have the adverse effects, predominantly being nausea and vomiting, pruritus and respiratory depression. Pruritus is described as one of the most common adverse effects, with a reported incidence of 30–100%.

Design: A retrospective study was conducted using data collected over a 21-month period on post-operative patients who had received intrathecal morphine as their post-operative pain management.

Methods: A two-phased approach was undertaken. The study was conducted to determine the incidence of ITMI pruritus among two patient groups, New Zealand Māori and New Zealand European, 96 subjects in total, and if treatment was received.

Results: The findings revealed significant ethnic disparities whereas New Zealand Māori had a significantly higher rate of ITMI pruritus than New Zealand European, New Zealand Māori experienced the pruritus with more intensity and are less likely to be treated for it.

Conclusion: Increased international knowledge and awareness for health professionals around the diversities of ethnicity and associated pharmacogenetics playing a significant role in patient response to opioid therapy can lead to improved overall care and patient satisfaction.

Keywords

Pain, post-operative, ethnicity, gender, adverse events, intrathecal morphine

Introduction

Worldwide, an estimated 230–234.2 million major surgeries are performed annually.^{1,2} Traditionally, moderate to severe pain was managed with intermittent doses of intra-muscular analgesics which were timed around the clock, with the later introduction of intravenous patient controlled analgesia.³ Due to the large scale of global surgery being performed, an increased emphasis

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has been placed on the importance of improved post-operative pain management.⁴

Background

Intrathecal morphine (ITM) has fast become a popular and effective post-operative analgesic for many different surgical procedures.⁵ A single dose of morphine injected into the cerebrospinal fluid (CSF) provides excellent analgesia for up to 18–24 hours after administration.⁶ ITM has been utilised for post-operative analgesia after surgery since 1979.^{5,7,8} Named appropriate to the route in which the morphine is administered, ITM is injected into the CSF at any level of the cerebrospinal axis.⁹ Anaesthetists throughout the world now offer this route of analgesia, and in combination with a spinal anaesthetic, for example, hyperbaric bupivacaine, ITM has proven to be a safe analgesic for a number of surgeries including orthopaedic and caesarean section procedures.^{10,11}

Sedation, respiratory depression, nausea and constipation^{12,13} are some of the side effects experienced with the use of morphine. However, when administered intrathecally, nausea and vomiting, pruritus, urinary retention and respiratory depression⁵ are frequently documented adverse effects.

Pruritus as an adverse effect of ITM appears to be dose related. As noted in the obstetric population, between 8% and 72% of patients can be expected to need some form of pharmacological intervention to treat pruritus when ITM is given in the dose range of 100–200 µg.¹⁴

The incidence of urinary retention has been reported at approximately 35%, followed by nausea and vomiting.⁵ A study by Gehling and Tryba⁵ indicates a 3% incidence of respiratory depression occurring in patients receiving ITM; however, the true incidence of significant respiratory depression is unknown.

Current understanding of intrathecal morphine-induced pruritus (ITMI) and its association with ethnicity is still in its infancy. Review of the literature indicates there are few studies that have been undertaken which discuss the topic of certain patient groups being more susceptible to the adverse effects of ITM than others.^{15,16} The incidence of ITMI pruritus is significant, yet the exact mechanism remains unclear.^{15,17–19} Klepstad et al.²⁰ proposed that a patient's genetic predisposition may influence their response to opioids. The authors observed that there were variations among responses on the clinical efficacy of morphine related to genetic influences. Their study also demonstrated genetic variability associated with ITM. Their findings suggest that the adverse effect of pruritus may also be influenced by genetic variation. Variations in response to morphine have also been observed in relation to gender influences.^{21,22}

The purpose of this study is to determine the incidence of ITMI pruritus and to determine whether ITMI pruritus is influenced by ethnicity, age or gender.

Methods

This study was conducted in a publicly funded facility in New Zealand. Data were taken from the medical records of patients undergoing caesarean sections and orthopaedic surgeries (total hip and knee joint replacements), who had received ITM as their post-operative analgesic management. A retrospective review of the medical notes of 992 surgical patients referred to the 'acute pain service' for management of their pain was undertaken. This study was performed on data that were collected over a period of 21 months. Records of patients admitted to the facility from 2009 to 2011 for surgical procedures were analysed.

Procedure

Ethics approval for this review was obtained from 'Northern Y Ethics Committee', New Zealand (Reference number NTY/11/EXP/073), and supported by the Regional Māori Health Services. The data collected included information from records that had been maintained on each patient for 18 hours post-operatively, assessing their pain status, adverse reactions, the severity of these reactions experienced and the treatment received.

Selection criteria

Patients who had undergone total hip arthroplasty, total knee arthroplasty or caesarean section procedures were selected. These groups were later organised into two groups: orthopaedic and caesarean groups. Only those patients of New Zealand Māori and New Zealand European descent were included (this information was recorded from the patients 'ethnic origin' as documented in their medical history).

Exclusions

Patients with allergies to morphine and those with a history of skin conditions and associated pruritus were excluded from the study. Also excluded were records that did not belong to either of the identified surgery groups or ethnic groups.

From all of the 992 patient records reviewed, a total of 129 ($n=129$) patients received ITM for their post-operative analgesic management. Of the 129 patients, four were excluded from the study as the surgeries did not fall into one of the three surgical categories identified for the study. A further 16 records were excluded

as they did not fall into the two ethnic categories and a further 13 records were omitted due to no documentation regarding the incidence of ITMI pruritus. There were a remaining total of 96 records deemed appropriate for this study. This process was cross-checked by independent transcribers to ensure results were not influenced in any way.

Statistical analysis

An 'audit tool' was developed by the first author (J.M.W.), and data were entered into a Microsoft Excel spreadsheet. This audit tool was developed to capture specific information required to track and record discernible evidence for this study.²³ The data were later imported into the Statistical Programme for Social Sciences (SPSS). With the assistance of a research statistician in New Zealand, Dr Chris Frampton, information was collected and evaluated for the presence of pruritus in relation to ethnicity, age, gender, type of surgery, actual dose of ITM, and the presence and intensity of pruritus using the Verbal Numeric Rating Scale (VNRS).²⁴ Zero pruritus is descriptive of having no pruritus, and pruritus measuring 10 out of 10 is described as the most intense itching ever or severe pruritus. The VNRS was chosen to simplify patient responses as pain scales were also measured on a scale of 0–10. Statistical analysis was performed using SPSS and data reflecting the incidence of the adverse effect of ITMI pruritus was measured by cross tabulation in relation to a number of variables. All the associated information and data were cross-checked by an independent source and transcribers who all completed confidentiality agreements.

Results

In total, 96 records were analysed for the study with subjects aged between 15 and 87 years and included both genders and were New Zealand Māori or New Zealand European.

The dosage of ITM varied from 50 to 400 µg. This dose was determined by the anaesthetist, who administered the intrathecal analgesic depending on the weight and age of the patient, and the type of surgical procedure they were undergoing.

Section 1: demographic data

ITM and ethnicity. Of the 96 records reviewed, 42% ($n=40$) of the patients were New Zealand Māori and 58% ($n=56$) were of New Zealand European descent.

ITM, ethnicity and gender. Of the New Zealand Māori, 82.5% ($n=33$) were females and 17.5% ($n=7$) were males. Of the New Zealand Europeans, 68% ($n=38$) were females and 32% ($n=18$) were males (refer Table 1).

Table 1. Demographics of all records included in audit ($n=96$).

Participants	%	<i>n</i>
New Zealand Māori	42	40
Females	82.5	33
Males	17.5	7
New Zealand European	58	56
Females	68	38
Males	32	18

Table 2. Demographics of surgeries, ethnicity and gender ($n=96$).

Participants	Caesarean		Orthopaedic	
	<i>n</i>	%	<i>n</i>	%
New Zealand Māori				
Females	30	64	3	6
Males			7	14
New Zealand European				
Females	17	36	21	43
Males			18	37

Of the 96 records reviewed, 74% were females ($n=71$). Of these, 71 females, 66% ($n=47$) underwent caesarean sections, and 34% ($n=24$) of the females underwent orthopaedic surgery. In the caesarean group, 64% ($n=30$) were New Zealand Māori, and 36% ($n=17$) were New Zealand European females.

In the orthopaedic group, 14% were New Zealand Māori males, and 37% were New Zealand European males. New Zealand Māori females made up 6% of the sample, and New Zealand European females made up 43% of this group. Of the 96 records, 26% ($n=25$) were male patients. Of the 25 male patients, 28% ($n=7$) were New Zealand Māori, and 72% ($n=18$) were New Zealand European (refer Table 2).

Section 2: incidence of ITMI pruritus

ITMI pruritus and ethnicity. In total, 30 of the 96 total records (31%) had indicated that the patient experienced ITMI pruritus: 47.5% ($n=19$) of the 40 New Zealand Māori versus 19.6% ($n=11$) of the 56 New Zealand European group; $p=0.004$.

ITMI pruritus, ethnicity and gender. Of the 25 male participants in this audit, 24% ($n=6$) experienced ITMI pruritus, four were New Zealand Māori and two were New Zealand European. From the total of 71 females, 34% ($n=24$) experienced ITMI pruritus, 62.5% ($n=15$) were New Zealand Māori, and 37.5% ($n=9$) were New Zealand Europeans (refer Table 3).

Table 3. ITMI pruritus associated with ethnicity and gender ($n=30$).

Participants	<i>n</i>
New Zealand Māori	19
Females	15
Males	4
New Zealand European	11
Females	9
Males	2

ITMI: intrathecal morphine-induced pruritus.

Table 4. Incidence of ITMI pruritus with ethnicity, gender and type of surgery ($n=30$).

Participants	<i>n</i>	Caesarean (<i>n</i>)	Orthopaedic (<i>n</i>)
New Zealand Māori	19		
Females	15	13	2
Males	4		4
New Zealand European	11		
Females	9	6	3
Males	2		2

ITMI: intrathecal morphine-induced pruritus.

ITMI pruritus, ethnicity, gender and type of surgery. Of the 47.5% of New Zealand Māori that experienced ITMI pruritus, 15 were females (79%) and 4 were males (21%). Of the 15 New Zealand Māori females experiencing ITMI pruritus, 13% ($n=2$) underwent orthopaedic surgeries and 87% ($n=13$) underwent caesarean sections.

Of the 19.6% New Zealand Europeans who experienced ITMI pruritus, nine were females (82%) and two (18%) were males. Of the nine New Zealand European females who experienced ITMI pruritus, 67% ($n=6$) had caesarean sections and 33% ($n=3$) underwent orthopaedic surgery. The two males in the New Zealand European group who experienced ITMI pruritus understandably only underwent orthopaedic surgery (Table 4).

ITMI pruritus, age, gender and ethnicity. From the total of 30 records where ITMI pruritus was documented, 18 patients (60%) were aged between 15 and 35 years. Of these 18 patients, 12 (67%) were New Zealand Māori and 6 (33%) were New Zealand European, and all were females. Only one record ($n=1$) indicated an age between 36 and 55 years and that was a New Zealand Māori female. There were nine records (30%) between 56 and 75 years of age that experienced ITMI pruritus. Of these nine, three (33%) were females and of these three, one was New Zealand Māori and two were New Zealand European. Also, of these nine records aged between 56 and 75 years of age, six (67%) were males. Of these six males, four were New Zealand

Table 5. ITMI pruritus and age, gender, ethnicity ($n=30$).

Participants	Age group (years)			
	15–35	36–55	56–75	76–95
New Zealand Māori				
Females	12	1	1	1
Males			4	
New Zealand European				
Females	6		2	1
Males			2	
Total	18	1	9	2

ITMI: intrathecal morphine-induced pruritus.

Table 6. Patient ITMI pruritus scores ($n=30$).

Participants	Score		
	1–3	4–6	7–10
New Zealand Māori	8	9	2
New Zealand European	8	2	1
Total	16	11	3

ITMI: intrathecal morphine-induced pruritus.

Māori and two were New Zealand European. There were two females ($n=30$) who experienced ITMI pruritus aged between 76 and 95 years, one New Zealand Māori and one New Zealand European (Table 5).

Section 3: ITMI pruritus scores and treatment

ITMI pruritic scores and ethnicity. In total, 16 of the records (53%) experienced minimal pruritus between 1 and 3 (0 = none, 10 = most intense pruritus ever). In this scoring group, eight (50%) were New Zealand Māori and eight (50%) were New Zealand European. There were 11 records (37%) that scored between 4 and 6. Nine (82%) were New Zealand Māori and two (18%) were New Zealand European. There were three records (10%) that scored between 7 and 10; two (67%) were New Zealand Māori and one (33%) was New Zealand European treatment (Table 6).

ITMI pruritus treatment and ethnicity. Of the 47.5% New Zealand Māori group that experienced ITMI pruritus after receiving ITM, 21% ($n=4$) were treated. Of the 19.6% New Zealand European patients who experienced ITMI pruritus, 36% ($n=4$) received treatment (Table 7).

Discussion

Overall, the results of the study show that ITMI pruritus did occur in 31% of subjects, which is consistent

Table 7. Records of ethnic groups who experienced ITMI pruritus and received treatment for it ($n=30$).

Participants	Pruritus/treatment	
	Experienced pruritus (n)	Received treatment (n)
New Zealand Māori	19	4
New Zealand European	11	4

ITMI: intrathecal morphine-induced pruritus.

with current literature.⁵ The results clearly show that the incidence of ITMI pruritus was much higher, with higher intensity among New Zealand Māori than those of the New Zealand European group ($p=0.004$).

More females than males experienced this adverse effect. The records indicated that ITMI pruritus was experienced by female patients who underwent caesarean sections, and these females were predominantly New Zealand Māori; however, further research is recommended to effectively explore these variations and their significance.

When comparing the association of ITMI pruritus with age, the patients were found to be predominantly younger, being either 35 years or younger. There was only one record of a patient that had experienced ITMI pruritus between the ages of 36 and 55 years. These results may be influenced by the fact that patients undergoing caesarean sections are generally younger than 35 years, and those undergoing orthopaedic joint replacements are predominantly older than 55 years of age.

Exploration of the association of ITMI pruritus with the type of surgery and dose of ITM reveals a general trend that it occurs in both orthopaedic and caesarean surgery and was more likely to be associated with doses between 50 and 200 μg of ITM.

Further exploration reveals that more than half the New Zealand Māori scored their pruritus as moderate to severe, whereas less than one-third of New Zealand Europeans scored their pruritus as moderate to severe. This shows that not only do New Zealand Māori experience a higher incidence of ITMI pruritus, but they experience it with greater intensity than New Zealand Europeans.

Although New Zealand Māori were more likely to experience ITMI pruritus, a considerably lower percentage of New Zealand Māori were treated for it than were New Zealand Europeans. This may be due to a number of factors; however, it is evident that more New Zealand Europeans either sought treatment or they were more likely to get treatment, than those of New Zealand Māori ethnicity. This finding may be significant as this may explain a possible disparity in the management of ITMI pruritus which has been identified in many studies.^{25–27} While reviewing literature regarding healthcare professionals' attitudes and management of opiates and their side effects, certain disparities were identified indicating

that treatments varied between different ethnic groups. These studies could not determine any reasons or rationale behind these disparities and recommended further research. This audit also cannot identify rationale for these statistics, as it is limited by its data. The concept that New Zealand Māori were more likely to not seek treatment or intervention for the ITMI pruritus has been postulated; however, further research is required into this topic to ascertain more awareness and understanding.

Conclusion

Overall, results of this audit have identified a number of themes: ITMI pruritus is significantly higher in the New Zealand Māori group, New Zealand Māori experience ITMI pruritus with more intensity, New Zealand Māori are less likely to be treated for ITMI pruritus and ITMI pruritus is associated with younger patients, with female patients and with doses between 50 and 200 μg .

For registered nurses and midwives providing care for post-operative patients, constant observation and assessment are vital. Managing the patient's post-operative pain adequately with the minimisation of adverse effects experienced is paramount for every healthcare professional involved in their care. Understanding that certain patient groups may be more susceptible to certain side effects or adverse effects and require preventative medication, or medication management to treat these side effects, is gaining more global recognition.

Increasing our knowledge and awareness of the diversities of ethnicity and cultures in response to opiate medications may lead to improved overall management. Nurses and midwives cannot control the amount of ITM the patient receives, but they can enhance vigilance in assessment and management of these patients with the knowledge that certain doses may affect patients differently. Increased education, and ensuring all patients are informed regarding the adverse effects of ITM that may be experienced and placing emphasis on the fact that there is treatment for these adverse effects, is paramount.

Acknowledgements

We thank Dr Chris Frampton for providing technical assistance with the Statistical Programme for Social Sciences (SPSS).

Conflict of interest

The author(s) declared no potential conflicts of interest with respect to the research, authorship and/or publication of this article.

Funding

The author(s) received no financial support for the research, authorship and/or publication of this article.

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