

## HemaTopics

## Open Access

# This Is Going to Hurt: Revisiting the Patient Experience of Bone Marrow Biopsies

Stephen Hibbs

**Correspondence:** Stephen Hibbs, *HemaSphere Scientific Editor* (stephen.hibbs@nhs.net).

*I am starting to feel a pattern is emerging, of acceding to a request on the basis of partial information and then not being able to pull out when the beans are fully spilled*

–Claire Gilbert, writing about her bone marrow biopsy during myeloma diagnosis in her collection of letters “*Miles to go before I sleep*”<sup>1</sup>

**B**one marrow aspirate and trephine (BMAT) is a common procedure for the diagnosis and response assessment of many hematological conditions. As a hematology registrar, I commonly consent patients for BMAT, perform the procedure, and hear patients’ reflections on their experience. I have listened to senior colleagues set expectations for the procedure—“it will just take five minutes”; “it is safe and generally well-tolerated”; or “it can be a little uncomfortable but it’s over quickly”—expectations that often do not reflect my observations of patients’ experiences. One conversation stands out: a patient in his 30s in remission from acute myeloid leukemia who required intensive chemotherapy, reinduction with chemotherapy post-relapse, and an allogeneic stem cell transplant. He told me that of the entirety of his healthcare experiences, his diagnostic bone marrow biopsy was the worst of them all. He had subsequently required a further 14 bone marrow procedures for response assessment or surveillance.

How common is pain in bone marrow procedures? Relatively few studies have sought to answer this question. A Swiss group prospectively surveyed 700 adult bone marrow procedures at a single centre, with patients reporting “bearable pain” in 59.6% and “unbearable pain” in 3.7% of cases.<sup>2</sup> Another prospective study surveyed immediate and postprocedural pain in 235 hemato-oncology adult patients at a Swedish centre. A total of 70% of patients reported pain: of these, 56% was moderate, 32% severe, and 3% the worst possible. Pain was present in 42% of patients at 3 days post-procedure, and 12% after 1 week.<sup>3</sup> There is inadequate evidence of pain incidence beyond this timeframe. However, one provocative study of patients reviewed in the pain clinic at the MD Anderson Cancer Center demonstrated a significant incidence of sacro-iliac joint (SIJ) pain in 4.95% of patients who had undergone bone marrow biopsy during the 1-year study period. The median time from BMAT to SIJ pain of 3.5 weeks in this study is beyond what would be usual for immediate post-procedure pain.<sup>4</sup>

It is worth noting that some of the most widely cited literature on BMAT morbidity (a series of UK surveys led by Professor Bain) was based on reporting from clinicians rather than patients. These surveys reported five incidents of persistent pain across 2 years of data collection with a denominator of 39,852 procedures (0.01% incidence).<sup>5,6</sup> This could reflect a very low incidence of persistent pain, or more likely reflects clinicians’ lack of enquiry about severe or persistent pain, or a perception that it is not noteworthy enough to report. Underestimation of pain in BMAT is common: one study reported that both doctors and nurses recognized pain to be severe in only one-third of cases where patients self-reported severe pain during BMAT.<sup>7</sup>

Pain is not distributed equally. Younger patients and those with higher body mass index experience more pain during BMAT.<sup>8</sup> Patients who have experienced severe pain in previous BMAT experience more pain in subsequent procedures.<sup>2</sup> The observation that unemployed patients experience higher levels of pain hints at the impact of social factors and power dynamics.<sup>3</sup>

Given that pain is reported by most patients during BMAT, why do clinicians commonly use euphemisms like “uncomfortable” or “mostly well-tolerated,” rather than directly acknowledging the likelihood of pain, which can be severe or persistent? There are likely to be several reasons. The first is amnesia: senior clinicians who set patients’ initial expectations of the BMAT may not have performed or even witnessed one for many years and may genuinely not know or remember how painful they are. Alternatively, clinicians may underemphasize pain with the

Department of Clinical Haematology,  
Barts Health NHS Trust, London,  
United Kingdom

Copyright © 2022 the Author(s).  
Published by Wolters Kluwer Health,  
Inc. on behalf of the European  
Hematology Association. This is an  
open access article distributed under  
the terms of the Creative Commons  
Attribution-NonCommercial-ShareAlike  
4.0 License, which allows others to  
remix, tweak, and build upon the  
work non-commercially, as long as  
the author is credited and the new  
creations are licensed under the  
identical terms.

HemaSphere (2022) 6:4(e710).  
<http://dx.doi.org/10.1097/HS9.0000000000000710>.

aim to minimize a patients' anxiety pre-procedure: while this may help patients who encounter minimal pain, others may be shocked by their experience and could lose confidence in the trustworthiness of their clinicians. We may be motivated by fear that the patient will refuse a crucial BMAT which is in their best interests, if we emphasize the painfulness of the procedure. Finally, there is likely to be a subconscious element of "not wanting to be the bad guy": during a positive and affirming encounter with a patient, we do not want to be tarnished by the prospect of causing them pain.

Can anything be done to reduce the pain experienced during and after BMAT procedures? Pediatric practitioners make use of pre-medications, deep sedation/general anesthesia, and modalities such as art therapy to help develop coping techniques through. In contrast, for adults undergoing BMAT in institutions I have worked with, pain relief is limited to local anesthesia, and if a patient is anxious, they may be offered a low dose oral benzodiazepine. The difference in practice is partly explained by the inverse correlation of pain and age, and partly from the increase of complications from sedation with increasing age, but also reflects different service provision limitations and clinician attitudes towards pain in adult and pediatric settings.

We can do better: many studies have demonstrated the value of pharmacological and non-pharmacological approaches to reduce pain in BMAT in adults. Three examples of effective interventions are music, buffered lidocaine, and tramadol. Music can reduce pain and anxiety experienced during BMAT<sup>9,10</sup> and can be easily offered to all patients. Buffering lidocaine with bicarbonate reduces pain during instillation of the anesthetic<sup>11,12</sup> and in one study reduced the overall pain experienced throughout the BMAT procedure.<sup>12</sup> A 50 mg dose of tramadol given 1 hour prior to procedure reduced the incidence of moderate or severe pain to 20% compared to 40% in patients receiving placebo, with no toxicities from tramadol seen. Tramadol has been shown to be safe and effective in reducing pain in other procedural settings such as dressing changes in burns patients<sup>13</sup> and during hysteroscopy.<sup>14</sup> In contrast, the effectiveness of inhalational nitrous oxide has not been consistently shown, although may still be helpful in some patient groups.<sup>15,16</sup>

There is surprisingly little research into how to train practitioners who perform BMAT. There is no published research in how to train doctors for BMAT, and only one published guideline for training and assessing the competency of nurse practitioners in carrying out the procedure.<sup>17</sup> It is informed by educational theory and provides a structure to procedural training, which improves upon the "see one, do one, teach one" approach and could be used for training doctors and other staff. Further work is needed on the effectiveness of simulation-based training,<sup>18</sup> and on the best approaches clinicians can take to patient education and communication.

In summary, we need to aspire towards "well-tolerated" and "slightly uncomfortable" BMATs by the deployment of pharmacological and non-pharmacological analgesic

methods, and by better methods of practitioner training. For the time being, we need to be honest about the likelihood and potential severity of procedural pain and allow patients to take this into account when deciding whether to go ahead with the procedure.

## REFERENCES

1. Claire G. *Miles To Go Before I Sleep*. London: Hodder & Stoughton; 2021.
2. Degen C, Christen S, Rovo A, et al. Bone marrow examination: a prospective survey on factors associated with pain. *Ann Hematol*. 2010;89:619–624.
3. Lidén Y, Landgren O, Arnér S, et al. Procedure-related pain among adult patients with hematologic malignancies. *Acta Anaesthesiol Scand*. 2009;53:354–363.
4. Roldan CJ, Huh BK, Chai T, et al. Sacroiliac joint pain following iliac-bone marrow aspiration and biopsy: a cohort study. *Pain Manag*. 2019;9:251–258.
5. Bain BJ. Bone marrow biopsy morbidity: review of 2003. *J Clin Pathol*. 2005;58:406–408.
6. Bain BJ. Morbidity associated with bone marrow aspiration and trephine biopsy - a review of UK data for 2004. *Haematologica*. 2006;91:1293–1294.
7. Lidén Y, Olofsson N, Landgren O, et al. Pain and anxiety during bone marrow aspiration/biopsy: comparison of ratings among patients versus health-care professionals. *Eur J Oncol Nurs*. 2012;16:323–329.
8. Valebjørg T, Spahic B, Bremtun F, et al. Pain and bleeding associated with trephine biopsy. *Eur J Haematol*. 2014;93:267–272.
9. Schandert LC, Affronti ML, Prince MS, et al. Music intervention: nonpharmacologic method to reduce pain and anxiety in adult patients undergoing bone marrow procedures. *Clin J Oncol Nurs*. 2021;25:314–320.
10. Shabanloei R, Golchin M, Esfahani A, et al. Effects of music therapy on pain and anxiety in patients undergoing bone marrow biopsy and aspiration. *AORN J*. 2010;91:746–751.
11. Kuivalainen AM, Ebeling F, Rosenberg P. Warmed and buffered lidocaine for pain relief during bone marrow aspiration and biopsy. A randomized and controlled trial. *Scand J Pain*. 2014;5:43–47.
12. Ruegg TA, Curran CR, Lamb T. Use of buffered lidocaine in bone marrow biopsies: a randomized, controlled trial. *Oncol Nurs Forum*. 2009;36:52–60.
13. Zhang XH, Gao XX, Wu WW, et al. Impact of orally administered tramadol combined with self-selected music on adult outpatients with burns undergoing dressing change: a randomized controlled trial. *Burns*. 2020;46:850–859.
14. Samy A, Nabil H, Abdelhakim AM, et al. Pain management during diagnostic office hysteroscopy in postmenopausal women: a randomized study. *Climacteric*. 2020;23:397–403.
15. Kuivalainen AM, Ebeling F, Poikonen E, et al. Nitrous oxide analgesia for bone marrow aspiration and biopsy - A randomized, controlled and patient blinded study. *Scand J Pain*. 2015;7:28–34.
16. Johnson H, Burke D, Plews C, et al. Improving the patient's experience of a bone marrow biopsy - an RCT. *J Clin Nurs*. 2008;17:717–725.
17. Jackson K, Guinigundo A, Waterhouse D. Bone marrow aspiration and biopsy: a guideline for procedural training and competency assessment. *J Adv Pract Oncol*. 2012;3:260–265.
18. Yap ES, Koh PL, Ng CH, et al. A bone marrow aspirate and trephine simulator. *Simul Healthc*. 2015;10:245–248.