RESEARCH ARTICLE

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Type and Level of Anxiety Affects the Perception of Pain During Bone Marrow Biopsy

ABSTRACT

Objective: Bone marrow aspiration and biopsy (BMAB) is an essential tool for diagnosis of hematological disorders. The most frequent complaint after BMAB is pain but the severity of this pain is described very different among patients. We investigated factors predicting this pain focusing on the role of state and trait anxiety.

Methods: One hundred and ten adult patients undergoing BMAB, were informed adequately and assessed with "The State-Trait Anxiety Inventory" (STAI) before the procedure. In this Likert-type inventory, State Anxiety Scale evaluates the current state of anxiety, asking how respondents feel "at that moment". The Trait Anxiety Scale evaluates relatively stable aspects of "anxiety proneness," including general states of confidence, calmness, and security. After the biopsy, pain was measured with visual analog scale.

Results: Most of the patients (71.8%) described mild pain but moderate to severe pain were significantly more frequent in both high state and trait anxiety groups. Pain severity had a positive but weak correlation with trait anxiety but not with state anxiety. The described pain level was associated with older age but was not with indication of biopsy, performance status, comorbidities or previous BMAB experiences.

Conclusions: Results of our study made us thought that a good communication with the patient and talking about possible outcomes days before procedure might play a role reducing his or her anxiety but because age and trait anxiety cannot be changed by using fast acting anxiolytic drugs, advantage of premedication with anxiolytics in order of reducing pain, would be limited.

Keywords: Biopsy, Pain, Anxiety.

Anksiyetenin Türü ve Düzeyi, Kemik İliği Biyopsisi Sırasında Ağrı Algısını Etkiler

ÖZET

Amaç: Kemik iliği aspirasyon ve biyopsisi (KİAB) hematolojik hastalıkların tanısında kullanılan önemli bir yöntemdir. İşlem sonrası en sık bildirilen yakınma ağrı olmakla birlikte; bu ağrı hastalar tarafından çok farklı düzeylerde tariflenmektedir. Çalışmamızda özellikle durumluk ve süreklilik anksiyetesini merkeze alarak, bu ağrıyı etkileyen faktörleri araştırmak istedik.

Gereç ve Yöntem: Merkezimizde KİAB planlamış 110 hasta, uygun şekilde bilgilendirilerek işlemden hemen önce Durumluk ve Süreklilik Anksiyete Ölçeği (State Trait Anxiety Inventory, STAI) ile değerlendirildi. Bu Likert tipi ölçekde "Durumluk Kaygı Ölçeği", katılımcıların "o anda" nasıl hissettiklerini sorarak mevcut kaygı durumunu değerlendirir. "Süreklilik Kaygı Ölçeği" ise genel güven, sakinlik ve güvenlik durumları dahil olmak üzere "kaygı eğiliminin" nispeten istikrarlı yönlerini değerlendirir. Biyopsi işlemi tamamlandıktan hemen sonra da hastaların ağrı düzeyleri "vizüel analog skala" ile değerlendirildi.

Bulgular: Hastaların çoğu (% 71,8) hafif ağrı tarifledi ancak orta ve şiddetli ağrı; hem yüksek "Durumluk kaygı" hem de yüksek "sürekli kaygı" gruplarında anlamlı olarak daha sıktı. Ağrı şiddeti ile sürekli kaygı arasında pozitif ancak zayıf bir korelasyon olmakla birlikte, durum kaygısı ile ilişkili bulunmadı. Hastaların bildirdiği ağrı düzeyleri ileri yaşla ilişkiliydi ancak biyopsi endikasyonu, hastanın performans durumu, komorbiditeleri veya önceki KİAB deneyimleri ile ilişkili değildi.

Sonuç: Çalışmamızın sonuçları, hastayla iyi bir iletişim kurmanın ve işlemden günler önce olası sonuçlar hakkında konuşmanın kaygısını azaltmada rol oynayabileceğini ancak yaş ve "sürekli kaygı" hızlı etkili anksiyolitik ilaçlar kullanılarak değiştirilemeyeceği için; anksiyolitiklerle premedikasyonun ağrı azaltmada avantajının sınırlı olacağını düşündürmüştür.

Anahtar Kelimeler: Biyopsi, Ağrı, Anksiyete.

INTRODUCTION

Bone marrow aspiration and biopsy (BMAB) is an essential tool for diagnosis and monetarization of hematological disorders. Serious adverse events were reported in less than 0.05% of procedures, so it could be named as a safe procedure (1). The most frequent complaint after this procedure is pain but the severity of this pain is described very different among patients. A prospective study emphasized that pain was a frequent complication; with a bearable pain about 60% and unbearable pain in 3.7% cases (2). Despite the progress in medicine, there was not much focus on studies considering this pain for many years. As medicine becomes more patient-oriented and more emphasis is being placed on patient well-being, we try to decrease the pain associated with medical procedures. The prevalence, predicting factors, and prevention of pain associated with BMAB has recently been investigated in different studies (2-10). Despite more information has been recognized, there are no clear data on pain-causing factors and how to use them in lessening this pain. In our study, we planned to determine the intensity of pain that our patients felt during BMAB procedure, in which we use only local prilocaine and "Adequate information before BMAB". We also investigated factors predicting this pain focusing on the role of state and trait anxiety.

MATERIAL AND METHODS

The study was approved by the ethics committee of the Duzce University School of Medicine with number of 2016-09 at 08.02.2016. All patients were properly informed and gave their written consent to participate in the study. The study was done prospectively in Department of Hematology, from March 2016 to October 2016. One hundred and ten adult patients, for whom bone marrow biopsy was planned for any reason and gave written consent were included. Exclusion criteria was pregnancy, disorders of consciousness, psychiatric disorders, neurologic disorders like Alzheimer or dementia and serious pain related to primary disease.

Clinical Data: Data on baseline characteristics and medical history were obtained from both patient records and interviews. For each subject; age, gender, indications for biopsy, ECOG performance status, duration of total hematologic investigations until BMAP and previous diagnoses are recorded. The information about procedure was given to patient in outpatient clinic, by experienced clinical hematologist and procedure was dated in a few days, in order to answer patient's further questions. Turkish version of "The State-Trait Anxiety Inventory" (STAI) which is a self-assessment inventory, is given to the patients to be answered 15-30 minutes before the biopsy procedure. After normal skin preparation and five minutes after instillation of 10 ml 2% prilocaine to the skin and deeper tissues, BMAB from the posterior iliac spine was carried out by one experienced author. The visual analogue scale (VAS) is used for quantifying pain and discomfort 15 minutes after the procedure. The pathological diagnosis of samples were added at the end of the study.

Measuring Anxiety: STAI is used to measure the presence and severity of current symptoms of anxiety and a generalized propensity to be anxious. This Likert-type inventory was developed by Spielberg et al. and translated into Turkish (STAI-TX) by Öner and Le Compte in 1985 (11). The reliability and validity studies of Turkish version revealed an internal consistency of 0.88- 0.87 and test-retest correlation of 0.71-0.86. (11,12). STAI-TX is a self-report questionnaire that can be administered in an individual format. There are 2 subscales within this inventory. The first part, the State Anxiety Scale (S-Anxiety) evaluates the current state of anxiety, asking how respondents feel "at that moment". The second part, the Trait Anxiety Scale (T-Anxiety) evaluates relatively stable aspects of "anxiety proneness," including general states of confidence, calmness, and security (13). Total scores for both state and trait (S-Anxiety and T-Anxiety scores) are calculated separately, ranging from 20 – 80 for each with the higher score indicating greater anxiety. The patients were grouped through median levels and compared with subscales as "low vs high S-Anxiety groups" and "low vs high T-Anxiety groups"

Measuring Pain: The visual analogue scale (VAS) for pain is a continuous scale comprised of a horizontal line, usually 10 centimeters in length, marked by 2 verbal descriptors, at the each end-points (14). For pain intensity, the scale is anchored by "no pain" (score of 0) and "worst imaginable pain" (score of 100 =100-mm scale) in Turkish. (15). The measures were recorded as mm and grouped 0-39 mm as mild pain, 40-69 as moderate pain and 70-100 mm as severe pain (16). Due to the small sample size in last two groups, these two groups merged into moderate-severe (40-100 mm) group.

Statistical Analysis: Retrospective studies and procedure count performed the year before, were evaluated to calculate the sample size and it was calculated at least 84 subjects with 80% power and 5% Type 1 error. Statistical analysis was performed using the SPSS (version 16.0, SPSS Inc., Chicago, IL, USA) software package. Distribution of numeric variables was tested by using both visual and analytical methods (Kolmogorov–Smirnov and Shapiro-Wilk tests). Descriptive analyses were presented using means ±standard deviations for normally distributed variables or median and interquartile range (IQR) for nonparametric continuous variables. Categorical variables were presented as numbers and percentages and compared using chi-square test.

One-way ANOVA was used to compare normally distributed parameters among groups. Comparisons of non-normally distributed parameters were performed by Kruskal–Wallis test. Comparisons between the two groups were performed with Student t-test for parametric data and Mann–Whitney U-test for nonparametric data. Spearman rank correlation test was performed to determine the relationships between continuous variables. All probability values were calculated by assuming a two-sided p-value of ≤0.05 with confidence intervals (CIs) at the 95% level.

RESULTS

Baseline clinical characteristics, diagnosis' and VAS-pain measurements of the patients are shown in Table 1. The median age was 64 (55-76) in whole group of 110 patients, including 51 males (46.7%) and 59 (53.6%) females. Median age was similar in both genders (63 at woman vs 64 at men) but significantly different in mild vs moderate/severe pain describing groups (62 vs 71 respectively, p=0.004).

Table 1. Baseline clinical characteristics of the patients

	Total n=110	Mild Pain (VAS<40) n=81	Moderate- Severe Pain (VAS≥40) n=29	P value
Age (years)	64 (55-76)	62(53-70)	71 (60-78)	**0.004***
Gender (male, N, %)	51 (46.7%)	39(48.1)	12 (41.4)	0.53
VAS score (mm)	20 (0.95-4.5)	11 (0-39)	55(41-100)	-
State Anxiety score (STAI-TX1)	40 (32-47)	37(31-47)	42(35-48)	0.057
Trait Anxiety score (STAI-TX2)	44.5 (40.75-50)	44 (40-49)	48(44-51)	**0.008***
Previous BMAB				0.977
No	95 (86.4%)	70 (86.4%)	25 (88.2%)	
Yes	15 (13.6%)	11 (13.6%)	4 (13.8%)	
Indication of BMAB				0.441
Anemia	26 (24.5%)	16 (61.5%)	10(38.5%)	
Thrombocytopenia	16 (15.1%)	11 (68.8%)	5(31.2%)	
Leukopenia	3 (2.8%)	3 (100%)	0	
Pancytopenia	9 (8.5%)	8 (88.9%)	1(11.1%)	
Monoclonal Gmp.	12 (11.3%)	10 (83.2%)	2(16.7)	
Polycythemia	2 (1.9%)	2 (100%)	0	
Thrombocytosis	17 (16%)	13 (76.5%)	4(23.5%)	
Leukocytosis	5 (4.7%)	2 (40%)	3 (60%)	
Staging	8(7.5%)	5 (62%)	3 (37.5%)	
LAP/HSM	3 (2.8%)	3 (100%)	0	
Response evaluation	5 (4.7%)	4 (80%)	1(20%)	
ECOG	1 (0-2)	1 (0-2)	1 (0-3)	0.804
Inter-trabecular Area	8(6-10)	8(6-10)	8(6-10)	0.982
Duration of evaluation (months)	2(1-4.75)	2 (1-5)	1.75 (0.625-3.375)	0.435
Comorbidities				0.099
None	26(34.2%)	23(88.5%)	3(11.5%)	
Solid malignancy	6(7.9%)	5(83.3%)	1(16.7%)	
Hypertension	15(19.7%)	12(80%)	3(20%)	
Diabetes	3(3.9%)	2(66.7%)	1(33.3%)	
Ch. renal disease	2(2.6%)	2(100%)	0	
Comorbidities >2	24(31.6%)	13(54.2%)	11(45.8%)	
Diagnosis				0.803
Non-diagnostic	17 (16%)	12(70.6%)	5(29.4%)	
Benign disorders	12(11.3%)	9(75%)	3(25%)	
MDS	32 (30.2%)	25(78.1%)	7(21.9%)	
MM	11(10.4%)	8(72.7%)	3(27.3%)	
MPN	22(20.8%)	16(72.7%)	6(27.3%)	
Leukemia	9(8.5%)	5(55.6%)	4(44.4%)	
Ca./Lymphoma	3(2.8%)	3(100%)	0(0%)	

VAS: visual analog scale, STAI-TX1: State Anxiety Scale,(= S-Anxiety), STAI-TX2: Trait Anxiety Scale (=T-Anxiety), BMAB: Bone marrow aspiration and biopsy, Monoclonal Gmp: Monoclonal Gammopathy, LAP/HSM: Lymphadenopathy or hepatosplenomegaly, ECOG: Eastern Cooperative Oncology Group Performance Status, Ch. renal disease: Chronic renal disease, MDS: Myelodysplastic Syndrome, MM: Multiple myeloma, MPN: myeloproliferative neoplasms, Ca:Carcinoma

Notes: Continuous variables are shown as mean ± SD if normally distributed and as median (IQR, interquartile range) if nonnormally distributed. Categorical variables are shown as frequency and percentages.* :p<0.05

The mean S-Anxiety and T-Anxiety scores were 40 (32-47) and 44.5(40.75-50), respectively in whole sample. Women had significantly have higher S-anxiety (41.9±10.1 vs 38±10.5, p: 0.028) and T-anxiety (47 vs 43.2, p: 0.006) scores compared to men. Median S-Anxiety score was slightly higher in patients describing the procedure more painful (median S-Anxiety score 37 (31-47) in mild vs 42 (35-48) in moderate/severe pain group) but it was not statistically significant (p=0.057). On the other hand, 69% of the moderate/high pain describing patients (VAS >40) had high trait anxiety (69% vs 31%, p: 0.017). Associated with it, median T-Anxiety score was significantly high (T-Anxiety scores 44 (40-49) vs 48(44-51), respectively in mild vs moderate/severe pain groups, p=0.03). Because the median values were also suggested to be clinically significant for symptoms [13], we used them as cut off points. The patients were grouped through median levels and compared in subscales as "low S-Anxiety" vs "high S-Anxiety" groups and "low T-Anxiety" vs "high T-Anxiety" groups.

Pain was measured with horizontal VAS and median VAS score was 20 (IQR 9.5-45 mm) in whole sample. VAS measurements were categorized mild pain as below 40 mm, moderate pain as 40-69 mm and severe pain higher than 70 mm, as described before. Majority (n:79, 71.8%) of patients who experienced BMAB marked it as a mild pain. It was defined as moderate by 19 (17.3 %) of patients and severe by only 12 (10.9%) patients. Because of the small sample size in moderate and severe pain groups, these two groups combined as "moderate to severe pain" with VAS ≥40 mm. When the two (mild vs moderate-severe pain) groups were investigated in terms of S-anxiety and T-anxiety levels, it is demonstrated that high S-anxiety was significantly more common in patients who described moderate-severe pain (p: 0.017).

According to S-Anxiety assessment, a total number 59 (53.6%) of patients had low S-Anxiety scores while were 51 (46.4%) of them had high S-Anxiety scores in whole sample. In low S-Anxiety group, 49 (83.1%) patients marked their pain as mild and 10 (16.9%) patients marked as moderate-severe. In high S-Anxiety group, same frequencies were 32(62.7%) and 19 (37.3%), making moderate-severe pain significantly more frequent in highly anxious subjects (37.3% vs 16.9%, p: 0.016, Figure 1).

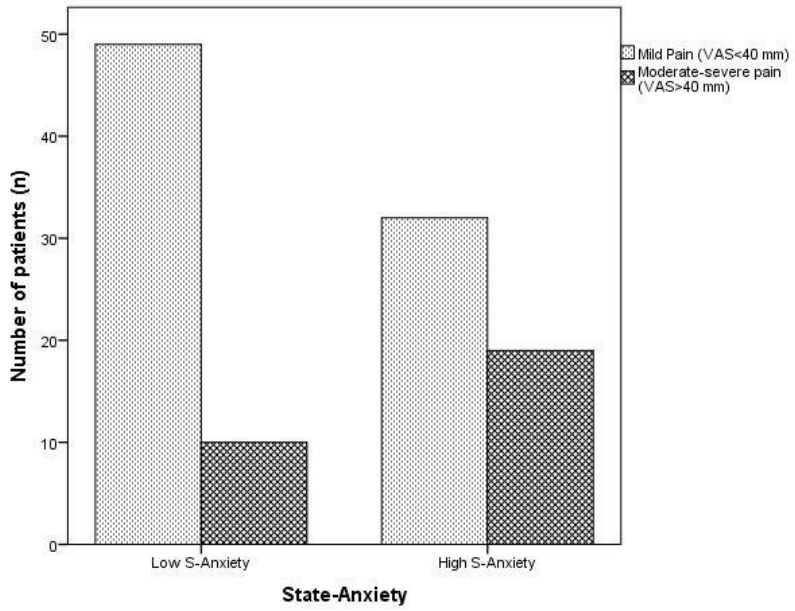

Fig. 1 Pain levels in different State-Anxiety (S-Anxiety) scales. In low S-Anxiety group, 49 (83.1%) patients marked their pain as mild and 10 (16.9%) patients marked as moderate-severe. In high S-Anxiety group, same frequencies were 32(62.7%) and 19 (37.3%), making moderate-severe pain significantly more frequent in highly anxious subjects (p: 0.016)

When patients' T-Anxiety scales were investigated, it was demonstrated that 55 (50%) patients had low and the other half had high T-Anxiety scores. In low T-Anxiety group, 46 (83.6%) patients marked their pain as mild and 9 (16.4%) patients marked as moderate-severe. In high T-Anxiety group, 35 (63.6%) patients were describing their pain as mild and 20 (36.4%) patients were describing as moderate-severe by using VAS. Like S-Anxiety group, there was a significantly high frequency of moderate-severe pain perception in highly anxious patients (36.4% vs 16.4%, p: 0.017, Figure 2). Actually, most of the patients who declared moderate-severe pain, were found highly anxious with both State and Trait antiety scales (Figure 3) Further analyzes revealed a weak but statistically significant positive correlation between the severity of pain and trait

anxiety levels (rs: 0.206, p: 0.03) but correlation between state anxiety and pain scores did not reach statistical significance (p: 0.13). Pain was not associated with indication of biopsy, ECOG, comorbidities, experiance of a previous BMAB, duration of evaluation (from the first application till BMAB), size of the biopsy as inter-trabecular area or final diagnosis (for all p>0.05, Table 1).

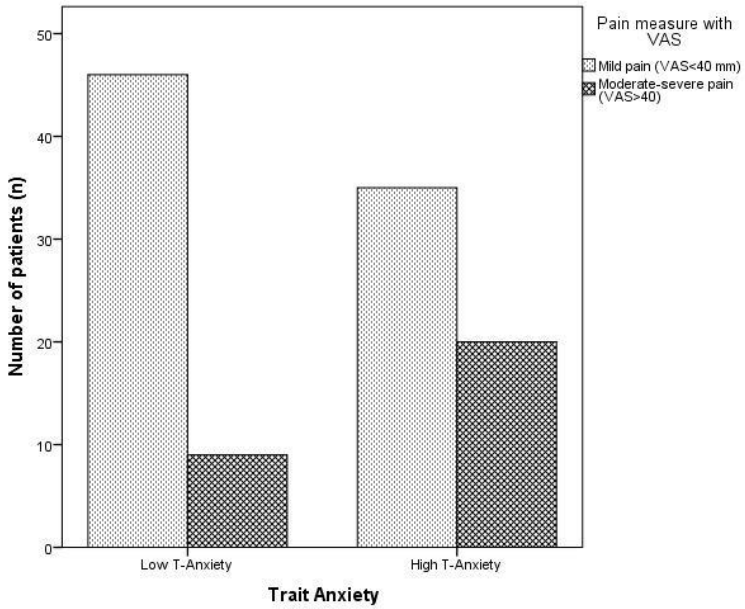

Fig. 2 Pain levels in different Trait-Anxiety (T-Anxiety) scales. In low T-Anxiety group, 46 (83.6%) patients marked their pain as mild and 9 (16.4%) patients marked as moderate-severe. In high T-Anxiety group, 35 (63.6%) patients were describing their pain as mild and 20 (36.4%) patients were describing as moderate-severe (p: 0.017)

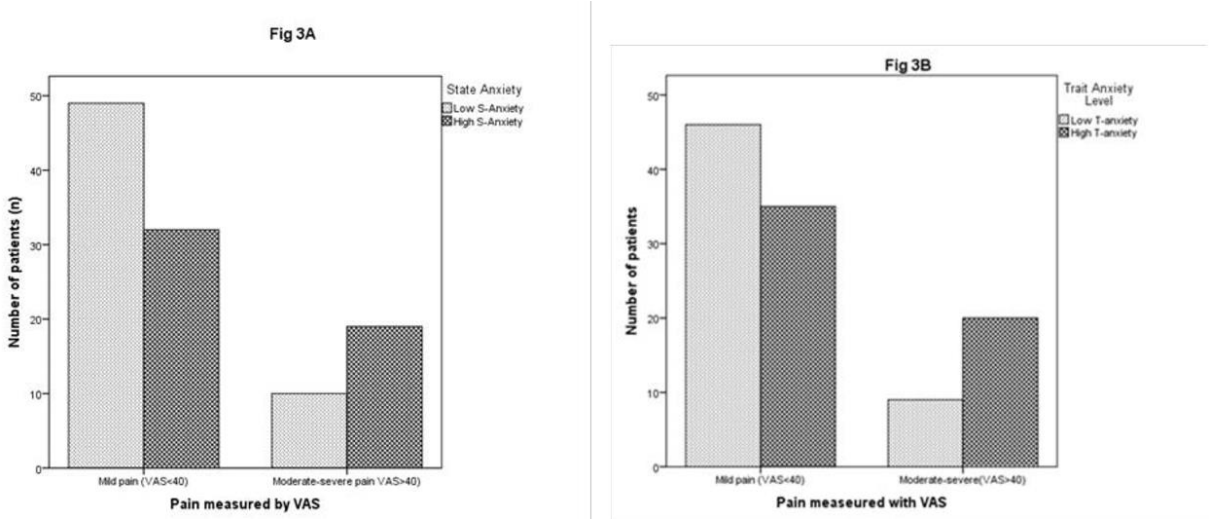

Fig. 3 Most of the patients who declared moderate-severe pain, were found highly anxious with both State and Trait antiety scales. Twenty nine patients declared moderate-severe pain of which, 19 (65.5%) had high State anxiety (S-anxiety, 3A) and 20 (69%) had high Trait anxiety (T-anxiety, 3B)

DISCUSSION

Examination of the bone marrow has a very important role in the diagnosis of hematological disorders, some of which are also periodically monitored with BMABs. After the routine core biopsy was added to the aspiration procedure, the discomfort began to be noticed (17). Inconstancy of this pain level could clearly be seen in studies at this area. The variety of methods of measuring pain may contribute this conflicting data. Never less, the BMAB is described as a painful procedure by most of the patients (ranging 63% to 86%) in all studies with different percent of patients describing it as "severe pain" (ranging 3.7% to 47%)(2,3,6,18,19). VAS is reported to be more sensitive and reliable in measuring pain intensity than other one-

dimensional scales (20,21), therefore, we used VAS to measure pain during BMAB.

In our study, majority (n:79, 71.8%) of patients who experienced BMAB, marked it as a "mild" pain, while it was defined as "moderate" by 19 (17.3 %) and as "severe" (VAS≥70) by only 12 (10.9%) of the patients. This percentage was consistent with Liden's study, in which, only local anesthesia was used like in ours (19). Less pain was reported in studies which BMAB was performed after premedication, but it has potential adverse effects (2,3,6). The need of trained nurse and area for observation, are other handicaps making this premedication difficult to use as routine practice in smaller clinics, like ours.

The studies focusing on factors predicting pain during BMAB reported different factors. In our study group, age and especially trait anxiety were the most relevant factors. Liden et al investigated pain predicting factors in patients who had hematological malignancies and described independent risk factors as pre-existing pain, anxiety about the diagnosis or needle-insertion, and low employment status (19). Age of the patient and duration of the procedure were reported as key factors associated with more severe pain adult patients undergoing BMAB (6). Gronkjaer et al. agreed that age is a key factor and also suggested that aspiration technique (22). According to one of the most recent studies, severe pain is significantly associated only with prior painful BMAB experience and lack of adequate information before procedure (2). This study showed the big influence of good information given by the physician to reduce pain during BMAB and brought to mind the question of whether it is related to anxiety.

In our study, we tried to uncover the role of anxiety on the level of pain felt during BMAB. Anxiety is described as a normal response to threats or challenges, especially those that are perceived to be uncontrollable. State anxiety is a temporary condition experienced in specific situations. It refers to transitory unpleasant feelings of apprehension, tension, nervousness or worry, often accompanied by activation of the autonomic nervous system. It reflects whether a person perceives the specific situation as threatening or not. Trait anxiety is a personality disposition that describes a person's tendency to perceive situations as threatening, and hence to experience state anxiety in stressful situations. Trait anxiety is not observed directly, but is expressed as state anxiety when stress is experienced. (23).

In our study, the pain was mostly associated with patients' age and trait anxiety which is a part of their personality and ordinary life. The age was found associated with pain two previous studies (6,22). To our knowledge, type and level of anxiety was investigated only in one study. Although they used a numerical anxiety scale, Brunetti et al had reported the pain was associated with anxiety (3), like in our study. We demostrated that trait anxiety was positively correlated with the intensity of pain and because trait anxiety is defined as "a personality disposition", medications may not effect this condition. Other factors we investigated like gender, previous BMAB experience, indication of BMAB, ECOG, quality of the specimen, duration of evaluation, comorbidities and diagnosis was not associated with pain.

The first studies in adult patients reporting different levels of pain, mostly focused anxiolytic/amnestic medications to reduce the recall of this pain but using lorazepam premedication results with disphoria and sedation which can cause problems in outpatient setting (17). Following studies using different premedications reported pain in reaching 63.3% and premedication-related complications at 20% - 32.7% of the patients (2,24). So, it is difficult to use these premedications at routine practice for most of the clinics which have to do BMAB as an outpatient procedure.

CONCLUSION

We demonstrated that majority (71.8 %) of patients' experienced mild pain during BMAB with a median VAS score of 20 mm in our population. Age and median T-Anxiety scores of the group describing moderate/high pain, were significantly higher. Significantly high frequency of moderate-severe pain perception was seen in highly anxious patients both in terms of state and trait anxiety but pain was only correlated with the trait anxiety levels.

Results of our study made us thought that a good communication with the patient and talking about possible outcomes days before procedure might play a role reducing his or her anxiety. Because age and trait anxiety cannot be changed by using fast acting anxiolytic drugs, advantage of anxiolytic premedication in order to reduce pain, would be limited.

Ethical approval: All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards. Informed consent was obtained from all individual participants included in the study.

Conflict to interest: The authors declare that they have no conflict of interest.

REFERENCES

1. Bain BJ. Bone marrow biopsy morbidity and mortality. Br J Haematol. 2003;121(6):949-51.
2. Degen C, Christen S, Rovo A, Gratwohl A. Bone marrow examination: a prospective survey on factors associated with pain. Annals of hematology. 2010;89(6):619-24. doi:10.1007/s00277-010-0934-0.

3. Brunetti GA, Tendas A, Meloni E, Mancini D, Maggiore P, Scaramucci L et al. Pain and anxiety associated with bone marrow aspiration and biopsy: a prospective study on 152 Italian patients with hematological malignancies. Annals of hematology. 2011;90(10):1233-5. doi:10.1007/s00277-011-1166-7.
4. von Gunten CF, Soskins M. Bone marrow biopsy symptom control and palliative care consultation. J Pain Symptom Manage. 2007;33(3):236-7. doi:10.1016/j.jpainsymman.2006.11.003.
5. Watmough S, Flynn M. A review of pain management interventions in bone marrow biopsy. J Clin Nurs. 2011;20(5-6):615-23. doi:10.1111/j.1365-2702.2010.03485.x.
6. Vanhelleputte P, Nijs K, Delforge M, Evers G, Vanderschueren S. Pain during bone marrow aspiration: prevalence and prevention. J Pain Symptom Manage. 2003;26(3):860-6.
7. Lord S, Bhuller K. Managing pain and anxiety in adult bone marrow examinations: combining pharmacological and psychological approaches. J Pain Symptom Manage. 2012;44(5):757-62. doi:10.1016/j.jpainsymman.2011.11.005.
8. Hjortholm N, Jaddini E, Halaburda K, Snarski E. Strategies of pain reduction during the bone marrow biopsy. Annals of hematology. 2013;92(2):145-9. doi:10.1007/s00277-012-1641-9.
9. Sollazzo F, Tendas A, Conte E, Bianchi MP, Niscola P, Cupelli L et al. Bone marrow aspiration and biopsy-related pain management. Annals of hematology. 2014;93(6):1061-2. doi:10.1007/s00277-013-1926-7.
10. McGrath P, Rawson-Huff N, Holewa H. Procedural care for adult bone marrow aspiration and biopsy: qualitative research findings from Australia. Cancer Nurs. 2013;36(4):309-16. doi:10.1097/NCC.0b013e31826f3bac.
11. Öner N, LeCompte WA. Durumluk-sürekli kaygi envanteri el kitabi. [Bebek, Istanbul]: Bogaziçi Universitesi Yayinlari; 1985.
12. Ömer Aydemir EK. Psikiyatride Kullanılan Klinik Ölçekler [Clinical scales used in psychiatry]. Ankara: Hekimler Yayın Birliği; 2014.
13. Julian LJ. Measures of anxiety: State-Trait Anxiety Inventory (STAI), Beck Anxiety Inventory (BAI), and Hospital Anxiety and Depression Scale-Anxiety (HADS-A). Arthritis Care Res (Hoboken). 2011;63 Suppl 11:S467-72. doi:10.1002/acr.20561.
14. Hawker GA, Mian S, Kendzerska T, French M. Measures of adult pain: Visual Analog Scale for Pain (VAS Pain), Numeric Rating Scale for Pain (NRS Pain), McGill Pain Questionnaire (MPQ), Short-Form McGill Pain Questionnaire (SF-MPQ), Chronic Pain Grade Scale (CPGS), Short Form-36 Bodily Pain Scale (SF-36 BPS), and Measure of Intermittent and Constant Osteoarthritis Pain (ICOAP). Arthritis Care Res (Hoboken). 2011;63 Suppl 11:S240-52. doi:10.1002/acr.20543.
15. Williamson A, Hoggart B. Pain: a review of three commonly used pain rating scales. J Clin Nurs. 2005;14(7):798-804. doi:10.1111/j.1365-2702.2005.01121.x.
16. Breivik H, Borchgrevink PC, Allen SM, Rosseland LA, Romundstad L, Hals EK et al. Assessment of pain. British journal of anaesthesia. 2008;101(1):17-24. doi:10.1093/bja/aen103.
17. Milligan DW, Howard MR, Judd A. Premedication with lorazepam before bone marrow biopsy. Journal of clinical pathology. 1987;40(6):696-8.
18. Talamo G, Liao J, Bayerl MG, Claxton DF, Zangari M. Oral administration of analgesia and anxiolysis for pain associated with bone marrow biopsy. Supportive care in cancer : official journal of the Multinational Association of Supportive Care in Cancer. 2010;18(3):301-5. doi:10.1007/s00520-009-0652-0.
19. Liden Y, Landgren O, Arner S, Sjolund KF, Johansson E. Procedure-related pain among adult patients with hematologic malignancies. Acta anaesthesiologica Scandinavica. 2009;53(3):354-63. doi:10.1111/j.1399-6576.2008.01874.x.
20. Cline ME, Herman J, Shaw ER, Morton RD. Standardization of the visual analogue scale. Nurs Res. 1992;41(6):378-80.
21. Collins SL, Moore RA, McQuay HJ. The visual analogue pain intensity scale: what is moderate pain in millimetres? Pain. 1997;72(1-2):95-7.
22. Gronkjaer M, Hasselgren CF, Ostergaard AS, Johansen P, Korup J, Bogsted M et al. Bone Marrow Aspiration: A Randomized Controlled Trial Assessing the Quality of Bone Marrow Specimens Using Slow and Rapid Aspiration Techniques and Evaluating Pain Intensity. Acta haematologica. 2016;135(2):81-7. doi:10.1159/000438480.
23. McDowell I. Measuring Health: A guide to rating scales and questionnaires. Third Edition ed. New York: Oxford University Press; 2006.
24. Mainwaring CJ, Wong C, Lush RJ, Smith JG, Singer CR. The role of midazolam-induced sedation in bone marrow aspiration/trephine biopsies. Clinical and laboratory haematology. 1996;18(4):285-8.