

EFFICACY OF DISPOSABLE SPINAL NEEDLE IN DIAGNOSTIC BONE MARROW ASPIRATION

Nasira Shaheen, Zahra Rashid, Muhammad Qaiser Alam Khan*, Waqar Azim

Army Medical College Rawalpindi, *Combined Military Hospital Lahore

ABSTRACT

Objective: To see the efficacy of disposable spinal needle in diagnostic bone marrow aspiration.

Study Design: Observational study.

Place and Duration of Study: Department of Haematology, Military Hospital and Army Medical College, Rawalpindi from 1st October 2008 to 31st September 2009.

Methodology: A total of 324 bone marrow aspirations were performed after obtaining informed consent. The study included both male and female subjects and was not restricted to a particular age group. After detailed clinical history and physical examination, blood counts were performed on Sysmex KX-21 hematology analyzer. Smears were examined to assess the indications for bone marrow aspiration. The procedure was conducted at posterior iliac spine in all cases except children under 2 years of age, for which tibia was the preferred site. A 16-gauge spinal needle was used, under sterile conditions using Lignocaine 2 % as a local anesthetic. Leishman Stain was used to stain the slides. Pearls reaction and cytochemical stains were used where required. Once prepared, the slides were examined under light microscope and the diagnosis was made in light of both the clinical presentation and microscopic findings. The results were analyzed on SPSS version 17.0.

Results: Out of 324 bone marrow aspirations diagnosis was possible in 295 cases. The most frequently diagnosed conditions were anaemia (Megaloblastic, Iron deficiency, Anaemia of chronic disorder), Leukemias (Acute Leukemias and Chronic Leukaemias) and reactive changes in bone marrow secondary to infection.

Conclusion: Disposable spinal needles are convenient, user-friendly, readily available (even in remote areas) and ensure sterilization in bone marrow aspiration.

Keywords: Bone marrow aspiration, Disposable spinal needle.

INTRODUCTION

Bone marrow is one of the most widely distributed organs in the human body¹. It is the principle site of blood formation at the time of birth, at which all the bone cavities are filled with haematopoietic tissue². In the normal adult, bone marrow cellularity decreases to 50% of that at birth³, the remainder of the marrow being composed of adipose tissue⁴.

Examination of the bone marrow may be the next step that follows an abnormal complete blood picture, peripheral smear or a suggestive clinical history and examination⁵. Bone marrow aspiration and biopsy are important medical procedures used in investigation, diagnosis and prognosis of haematological⁶ and non haematological disorders⁷. During marrow

from posterior iliac crest or sternum with a special needle, smeared on a glass slide and stained for microscopic evaluation⁸.

Throughout history, there has been a rapid evolution in the instruments and techniques used to obtain and evaluate bone marrow. Trepanning of bone is the oldest known procedure carried out by man and yet, it is only in the last 100 years that we have made use of this technique to diagnose and treat haematological diseases. In fact, in its most primitive form, the procedure dates as far back as the Neolithic period and entailed the drilling of cranial bones as a form of intervention for headaches, epileptic disorders and mental illnesses⁹. However, it was not until 1905, that the Italian physician Pianese reported bone marrow infiltration by the parasite *Leishmania donovini*. Over the course of time, various needles¹⁰ have been invented to carry out bone marrow aspirations and biopsies. These include Islam, Salah, Kalima and Jamshedi Needles^{11,12}.

Correspondence: Dr Nasira Shaheen, Assistant Prof of Pathology, Army Medical College Rawalpindi
Received: 07 Dec 2010; Accepted: 26 Jul 2011

aspiration, liquid bone is aspirated (by suction)

For carrying out bone marrow aspirations, the spinal needle has emerged as a convenient, user-friendly and cost-effective alternative¹³. The objective of this study was to see the efficacy of the disposable spinal needle in diagnostic bone marrow aspiration.

METHODOLOGY

An observational study was conducted from 1st October 2008 to 31st September 2009 at Haematology Department of Army Medical College and Military Hospital, Rawalpindi. All patients referred to the Hematology Department of Army Medical College and Military Hospital Rawalpindi, requiring bone marrow examinations were included. All bone marrow aspirations were performed using 16-gauge spinal needle¹⁴.

Detailed clinical history was obtained and physical examination of the subjects was performed to assess the need for and the relevance of the procedure. Blood counts were performed on Sysmex KX-21 Hematology Analyzer. Smears were examined by the principle investigator to assess the indications for bone marrow aspiration. Having established these, the procedure was conducted using 16-gauge spinal needle. Leishman Stain was used to stain the slides and Pearls reaction and cytochemical stains were used when necessary. Once prepared, the slides were examined under light microscope and the diagnosis was made in the light of both the clinical presentation and microscopic findings¹⁵.

Prior to 2008, all bone marrow examinations had been conducted using Islam needles, which yielded excellent results. In this study, the spinal needle was used in all bone marrow examinations in the time duration aforementioned.

RESULTS

A total of 324 referred cases requiring bone marrow were included in the study. The patients' age ranged between three months to ninety years, with a mean age of forty years. Two hundred and 63 patients were males and 61 were females. All bone marrow aspirations were performed, using 16-gauge spinal needles,

under local anesthesia. The procedure was uneventful in all the cases and did not result in any complications.

Diagnosis was possible in 295 cases. Results are given in (Table 1).

Data was analyzed using SPSS version 17. Mean values and standard deviations were calculated for quantitative variables. Frequencies and percentages were calculated for qualitative variables.

DISCUSSION

Procedural yield with disposable spinal needle was as good as that with Islam needle¹⁶. Moreover, we being a third world country cannot afford to spend a lot on procedural instruments where the same result can be achieved with minimum cost and expertise.

Disposable spinal needles are readily available and convenient to use and transmission of HIV, Hepatitis B and C are minimized. On the other hand, needle blunting, need for sterilization and non-availability limit the use of Islam needle¹⁷. Due to this, some patients have been regretted bone marrow aspiration in certain ill-equipped setups where the procedure could easily have been

Table-1: Results of bone marrow examination

Diagnosis	Number	Percentage
Deficiency Anaemia	68	30.0
Leukemia	53	16.4
Anaemia of Chronic Disorder	29	8.9
Myelodysplasia	23	7.1
ITP	20	6.2
Reactive changes in marrow	20	6.2
Multiple Myeloma	12	3.7
Aplastic Anaemia	09	2.8
Hemolytic Anaemia	05	1.5
Non-Haematological Disorders	28	8.6
Others	28	8.6
Diluted marrow	19	5.9
Normal marrow	10	3.1
Total	324	100.0

performed with disposable spinal needle.

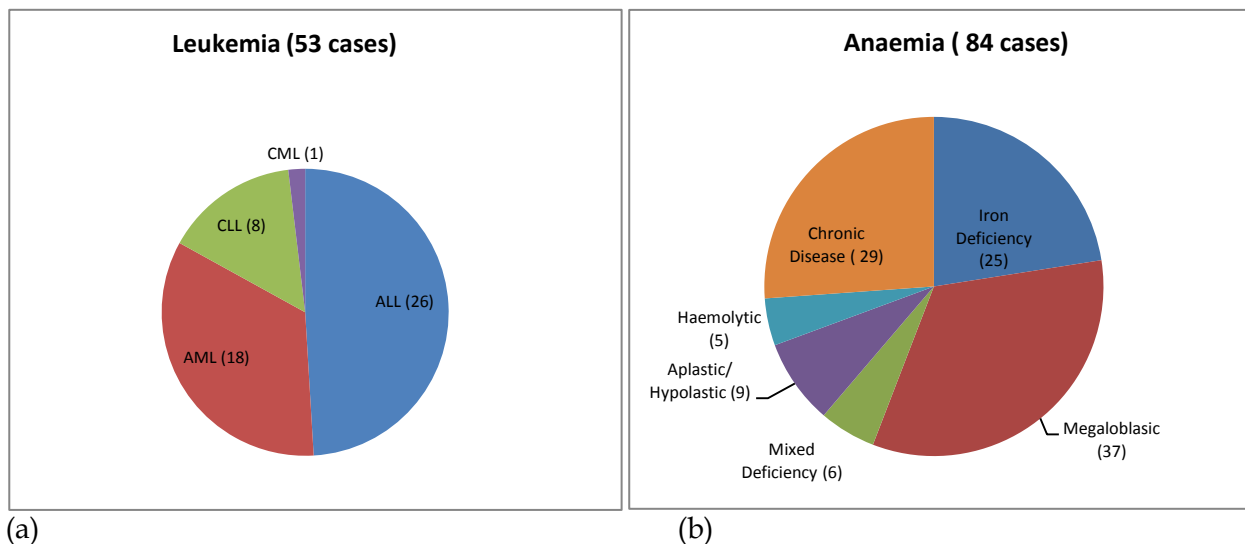


Fig. 1: Pie chart (a, b) showing distribution of anaemia and leukemia

Non-Haematological Disorders Diagnosed on Bone Marrow Aspiration (28 cases)

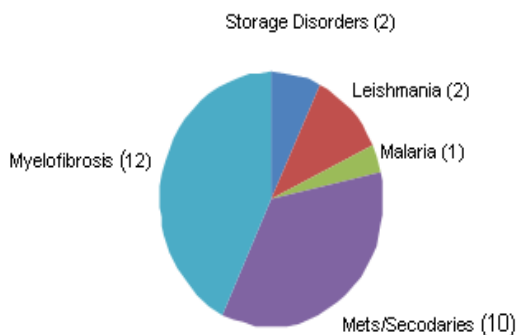


Fig. 2: Pie chart showing distribution of other condition on bone marrow examination

Other Disorders (28 cases)

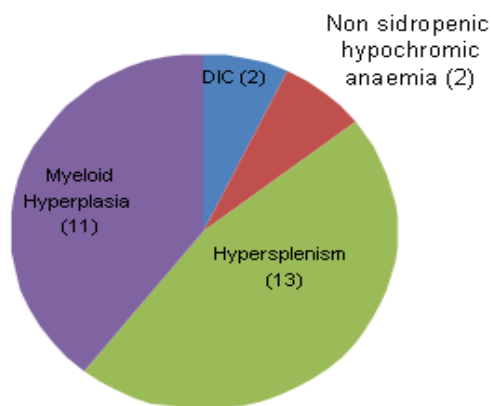


Fig. 3: Distribution of non-hematological conditions on bone marrow examination

The reasons for failure of the technique with disposable spinal needle are the same as those found with conventional Islam Needle and are related to the type of blood disease (myelofibrosis, severe aplastic anaemia and osteomyelosclerosis). In these conditions, using standard larger needles for marrow aspiration will not yield a diagnosis and bone marrow biopsies must be carried out to establish the diagnosis¹⁴.

Considering costs, 16 gauge spinal needle has a price range from Rs 45 to Rs 110. On the other hand, the price range for the Islam needle varies from Rs 1800 to Rs 2500. The fact that the Islam needle is not disposable does not confer much advantage regarding its utility. It has

been observed that the Islam needle undergoes blunting and this begins to affect procedural yield if it is used more than 4-5 times. The electricity, manpower and time required for its sterilization imposes a further strain on the limited resources of most medical set-ups. This is where the spinal needle proves to be extremely economical as it is disposable and does not require sterilization and is much cheaper to purchase as well. Hence using spinal needle to perform bone marrow aspiration instead of Islam Needle is much more cost effective, feasible and affordable for the patient and health services likewise.

Bone marrow aspiration with disposable spinal needle¹⁴ is more cost-effective,

convenient and does not compromise procedural yield. Most importantly, the procedure can be done anywhere and at anytime due to easy availability and no prior requirement of instrument sterilization.

Bone marrow examination may be performed in almost every hospital laboratory, even in remote areas. It should not be denied to patients due to non-availability of procedural needles. The disposable spinal needle is much more readily available than Islam needle and bone marrow aspiration at least can be easily performed by medical specialists where pathologist is not available. It is a simple procedure and must not be denied to a patient on the pretext of being part of the hematologist's realm only. Sending the patients to referred hospitals is no necessary.

In cases where trephine biopsy is essential along with bone marrow aspiration to confirm diagnosis, patients have to be referred to a tertiary care hospital for diagnosis and further management which is usually not possible in peripheral setups. Among the 324 cases that we dealt with in our study, only 9 (2.8%) yielded aplastic/hypoplastic marrow which had to be confirmed by trephine biopsy. There were only 8 (2.5%) cases of chronic lymphocytic leukemia. Trephine biopsy was required for staging purposes only. In a study conducted at CMH Sialkot, disposable spinal needle was used to perform 106 bone marrow examinations. Diagnosis was established in over 90% of the cases on the basis of bone marrow aspiration alone¹⁸.

CONCLUSION

Disposable spinal needles are convenient, user-friendly, readily available (even in remote areas) and ensure sterilization in bone marrow aspiration. In our quest to provide optimal

health care, we must not deny this simple procedure where it is indicated, on the pretext of non-availability or lack of sterilization. Spinal needles should be widely employed by hematologists and medical specialists as diagnostic tools, especially in setups where availability and resources are limiting factors.

REFERENCES

1. Roger S Riley, Thomas S. Hogan, Dawn R. Pavot. A pathologists's perspective on bone marrow aspiration and biopsy. *J Clin. Lab. Anal* 2004; 18: 70-90.
2. Bain BJ. Bone marrow aspiration. *J Clin Pathol* 2001; 54:657.
3. Ozkalemkas F, Ali R, Ozcelik T, ozan U, ozturk H, et al., The bone marrow aspirate and biopsy in the diagnosis of unsuspected nonhematologic malignancy: a clinical study of 19 cases. *BMC Cancer* 2005; 5:144.
4. Brynes RK, McKenna RW, Sundberg RD. Bone marrow aspiration and trephine biopsy. An approach to a thorough study. *Am J Clin Pathol* 1978; 70:753.
5. Cotelingam JD. Bone Marrow Interpretation: The Science and the Art. *Pathology Case Reviews* 2000: 239-51.
6. James D. Bearden, Gary A Ratkin. Comparison of the diagnostic value of bone marrow aspiration and bone marrow biopsy in neoplastic disease. *J Clin Pathol.* 1974;27(9): 738-40.
7. Rodrigues AF, Gray RG, Preece M A, Brown R. The usefulness of bone marrow aspiration in the diagnosis of Niemann-Pick disease type C in infantile liver disease. *Arch Dis Child* 2006; 91:841-844.
8. Bone marrow aspiration. *J Clin Pathol* 2001; 54: 657-63.
9. Parapia LA. Trepanning or trephines: a history of bone marrow biopsy. *Br J Haematol* 2007; 139(1): 14-9
10. Malenpati S, Joshi S, Lai S. Bone marrow aspiration and biopsy. *N Engl J Med* 2009; 361: 28.
11. Knowles S, Hoffbrand AV. Bone marrow aspiration and trephine biopsy. *Br Med J.* 1985; 281(6235): 280-1
12. Bain BJ. Bone marrow biopsy morbidity and mortality. *Br J Haematol* 2003; 121(6): 949-51.
13. Dinndorf PA, Clark BS, Bleyer WA. Bone marrow aspiration with a 22-gauge spinal needle. *J Pediatr* 1982 ; 100 : 59
14. Eugenio E. Damasio, Raffaella Cerri, Bahman Masoudi. Bone marrow aspiration from posterior iliac crest using sterile and pyrogen free disposable spinal needle. *Haematologica* 2000; 85: 871-896.
15. Anwar Ul Islam. Bone marrow aspiration before bone marrow core biopsy using the same bone marrow biopsy needle. *J Clin Pathol* 2007; 60: 212-215
16. Islam A. Manual of bone marrow examination. Arrosterdan: hardward Academics: 1997.
17. Anwarul Islam. A new bone marrow aspiration needle to overcome sampling errors inherent in the technique of bone marrow aspiration. *J Clin Pathol.* 1983; 36(3): 954-958.
18. Shaheen N, Khan QA, Azim W, Ali N. Bone marrow aspiration: the diagnostic tool in hematological and non-hematological disorders. *Pak J Pathol* 2010; 21: 1-418.