AN AUDIT OF INTRAMEDULLARY REAMING BIOPSY IN LONG BONE METASTATIC DISEASE. EVALUATION OF ITS DIAGNOSTIC VALUE AND REAMING SAMPLE ADEQUACY

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ABSTRACT

Objective: To evaluate diagnostic accuracy and sample adequacy for analysis of intramedullary reaming in diagnosed patients of long bone metastatic disease.
Study Design: Cross sectional study.
Place and Duration of Study: Lady Reading Hospital, from Jan 2014 to Apr 2018.
Methodology: Review of 53 consecutive cancer patients who underwent intramedullary nailing for long bone metastatic disease at Lady Reading Hospital from January 2014 to April 2018.
Results: In 21 of the 53 patients (40%) a positive diagnosis of metastatic bone disease was confirmed and in 38 out of 53 (72%) sample was considered adequate tissue for histopathological analysis.
Conclusion: Our study did not support the reliability of intramedullary reaming sample biopsy in metastatic long bone disease.

Keywords: Bone, Metastatic disease, Reaming.

INTRODUCTION

Bone metastasis continues to challenge orthopaedic surgeons especially in presence of increased survival rate of patients with carcinoma has led to increasing population with bony metastasis. Osseous metastasis is more common then primary bone tumour where bone is third common site of metastasis after lung and liver[1]. The most common site of long bone metastasis is the femur followed by humerus and Tibia[2].

Approximately 70% of all patients affected from prostate and breast cancer while 35-42% of patients with renal, lung and thyroid cancer on postmortem evaluation have skeletal metastasis[3]. Generally, surgical intervention is recommended for long bone metastatic disease where there is an acute pathological fracture or impending fracture keeping in consideration patients general health status and life expectancy[4].

Histopathological analysis in presence of skeletal metastasis is vital to establish whether a lesion is different from primary or benign or there is either recurrence or change in tumour cells characteristics and appearance[5,6]. In routine clinical practise while performing intramedullary nailing of long bone metastasis reaming samples are sent for histopathological analysis.

METHODOLOGY

We reviewed all identified cancer patients records at our institute who underwent intramedullary nailing for long bone metastatic disease from January 2014 to April 2018 at Lady Reading Hospital in this study by non-probability consecutive sampling method. Inclusion criteria were patients with diagnosed osseous metastasis disease undergone intramedullary nailing where tissue reaming was sent for histopathological evaluation. Exclusion criteria were patients in which femoral head was sent as specimen or where intramedullary device was not used were excluded.

Therapeutic intramedullary nailing was performed for pathological fractures whereas prophylactic intramedullary nailing was offered to those with impending fracture. Impending fracture was defined, as fracture of a given bone is

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likely to happen under physiological loading or trivial injury. Mirel's scoring system was used as a classification system for evaluation and decision-making in impending pathological fractures[7,8]. Consultant histopathologist assessed adequacy of reaming sample and tumour tissue diagnosis. Reaming sample adequacy was defined as sample containing sufficient tissue to allow complete histological evaluation including more specific test such as cytogenetic and immunohistochemistry. This was achieved by reading all histopathology reports during the study period.

All data collected were completely anonymised. Statistical analysis was performed using SPSS-23. Descriptive statistics for nominal data was recorded as percentage, whereas mean ± SD for continuous data. The Chi square test of independence was used to determine if there was significant relationship between two nominal variables i.e. reaming tissue sample adequacy and diagnostic accuracy.

RESULTS

Fifty three patients with confirmed long bone metastasis were identified that met inclusion criteria. Out of these 53 patients 24 (45%) were women and 29 (55%) men. The mean age was 60.6 years (range, 39-81 years). The most common primary cancer in our study was of the breast followed by multiple myeloma and lung cancer respectively (fig-1). Therapeutic nailing of a pathological fracture was performed in 28 (52.8%) whereas prophylactic nailing was done in 25 (47.2%). The most frequently involved long bone intramedullary nailing was performed in femur 45 (85%) followed by humerus 6 (11%) and tibia 2 (3.8%) respectively. Only 21 of the 53 patients (40%) were given a positive diagnosis of metastatic bone diseaseas a result of bone reaming samples (fig-3). Twenty eight percent (n=15) of sample was reported as inadequate mostly due to the fact that no recognizable tissue could be histologically identified (fig-2).

DISCUSSION

The majority of patients who presented with impending or complete pathological fractures secondary to skeletal metastasis will be managed by general orthopaedic and trauma surgeons rather than specialists in orthopaedic oncology in our set up. In long bone metastatic disease

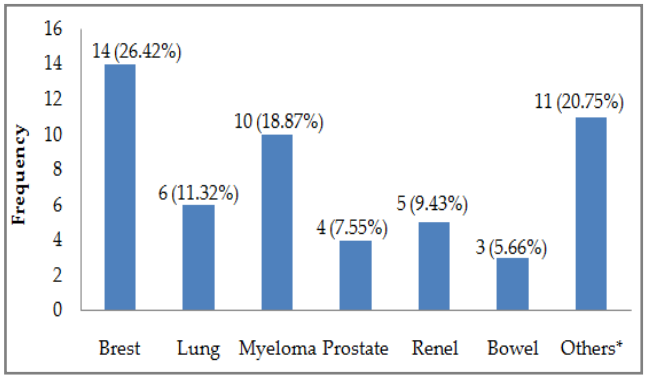

Figure-1: Frequency distribution by primary tumour type.

*Others (Haematological, bladder, oesophagus, melanoma).

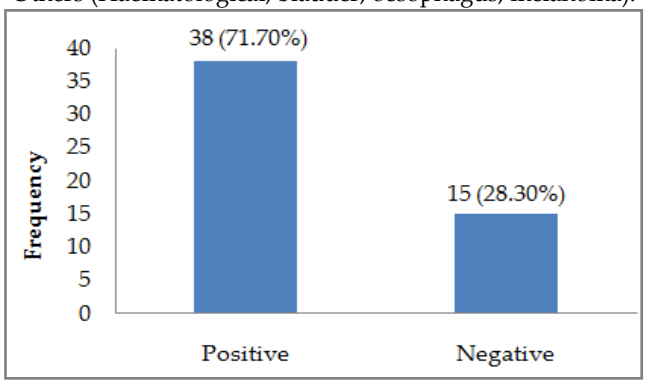

Figure-2: Distribution by adequacy of reaming sample for histopathological analysis.

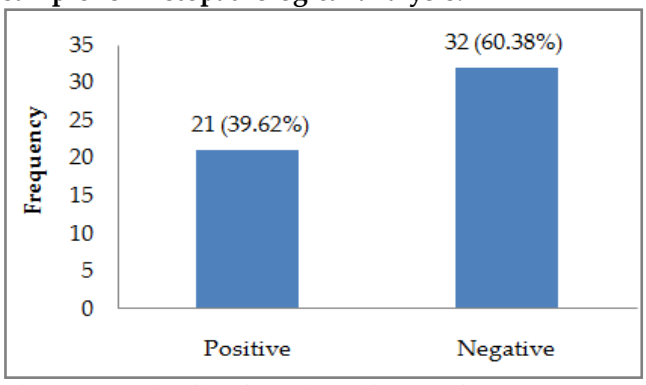

Figure-3: Distribution by diagnostic accuracy of reaming sample for metastatic bone disease.

intramedullary nailing is considered to be a safe and effective management option as it provides adequate stability by minimally invasive method and its technique is generally reproducible as its similar to traumatic fracture nail insertion[9,10]. In

order to accurately stage the disease and optimise the treatment strategies for cancer patients, it is vitally important to reachprecise diagnosis[11].

The need for arranging biopsy in a suspected metastatic long bone lesion is clinically indicated in three scenarios: (a) to assess a solitary lesion/ multiple lesions in patient with known primary but no previous history of metastatic bone disease; (b) to diagnose or restage metastasis in patients with previous history of primary tumor but no history of osseous metastasis; (c) to collect tissue for further evaluation including immune-histochemical and hormonal analysis [12,13].

Our aim is to establish diagnostic value of intramedullary reaming sample biopsy while doing surgical stabilisation in patients with confirmed diagnosis of metastatic bone disease.

In our series of 53 cases of intramedullary reaming biopsies the most common primary was from breast followed by myeloma and lung cancer respectively (fig-1) which is similar to results published by Afinowi *et al* with slight variability as in their study, breast was followed by lung and myeloma respectively in terms of most common primary tumor[6].

We have found that most common long bone intramedullary nailing was performed for femur 45 (85%). Afinowi *et al* reported a similar figure in their study in 2017 on in intramedullary reamings however; No tibial intramedullary nailing was performed in their patients[6]. In contrast 2 (3.8%) locked ante-grade tibial nailings were undertaken in our patients. Kelly *et al* in their multicenter study of 592 bony metastasis only 26 (4.4%) were found in tibia[14].

Twenty eight percent (n=15) of tissue samples in our study were inadequate (p=0.002) as the sample contained insufficient tissue to allow complete histopathological assessment including more specific tests (fig-2). Our this finding is comparable to study by Hassan *et al* as in there study sample was inadequate in thirty five percent of the cases[15]. In contrast Clark *et al* reported that sample was adequate in all of the 17 cases in their study and Afinowi *et al* published 96% adequacy of sample in their study population[6,16].

In our study only 21 of the 53 patients (40%) were given a positive diagnosis of metastatic bone disease (p=0.0131) (fig-3). Whereas in comparison Hassan *et al* reported that reaming biopsy are unhelpful in 35% of cases[15]. Afinowi *et al* published that 51% of reaming sample were reported with positive histological diagnosis of metastatic bone disease[6]. In contrast Clark *et al* in the there series of 17 cases reported positive histological diagnosis in all cases[16]. We are not able to answer for theses contradictory findings of differing rate of histopathological tissue diagnosis.

Reaming while performing intramedullary nailing for metastatic bone disease is an attractive option in current practice as it allows to sample large area of intramedullary canal without requiring any additional intervention at time of surgery. However, we observed in our study that only 40% of the samples were diagnostic and 72% of reaming sample were considered adequate by a histopathologist. This can be explained by the fact that medullary canal reaming can cause mechanical and thermal damage to surrounding structures and also secondly this technique of taking reaming is non-targeted and there is an increased chance of missing the lesion while taking the sample which is taken from whole medullary canal instead of targeting the specific lesion. Furthermore, where the sample was taken in presence of pathological fracture, reaming sample may have collected fracture site debris including callus and fracture site haematoma leading to reduce fraction of tumour tissue available for biopsy. For majority of our cases we couldn't establish the technique of intramedullary sampling for each case but in majority conventional method was undertaken where reaming sample are usually taken from reamer blade where the technique is non targeted and it is difficult to differentiate normal tissue from diseased tissue[18,19].

There are various techniques described to improve tissue sampling during intramedullary

nailing of long bone metastasis which include laparoscopic grasper, Charnley spoon, aspiration by small bore chest tube, Lloyd David biopsy forceps, large bore plastic catheters, long bron-choscope biopsy forceps[6,15,17-20]. Nevertheless, there are no comparative studies of a forementioned techniques with conventional technique of intramedullary tissue sampling. As previously stated we couldn't record any specific technique of sampling hence we can not validate any specific sampling method which can improve sample accuracy during long bone nailing which may warrant further study.

The limitation of our study was, its retrospective design and its inability to endorse any specific intraoperative sampling method. Also it was limited to a single center. To investigate this further a multicenter designed study is recommended.

CONCLUSION

Although reaming specimen can be sent for histological evaluation while performing surgical stablisalisation of long bone metastatic disease but diagnostic accuracy and tissue sampling adequacy is less then optimal. This investigation can be utilized as an adjunct to other available established modalities for investigation.

CONFLICT OF INTEREST

This study has no conflict of interest to be declared by any author.

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