A Comparative Study About Diagnostic Yield of Fluoroscopy Guided Transpedicular Biopsy Done by Orthopaedicians v/s CT Guided Biopsy Done by Radiologists in Cases of Koch's Spine

Meet Shah[1], Ashok Rathod[1], Punith K[1], Rohan Killekar[1], Kunal Bharadwaj[1]

Abstract

Introduction: Tuberculosis is one of the leading causes of mortality worldwide due to a single infectious agent. Koch's spine or spinal tuberculosis is one of the most crippling manifestations of extra-pulmonary tuberculosis. Owing to the lack of image-guided biopsy centers and the high prevalence of the disease, most of the patients are diagnosed and treated on clinical grounds. This practice was thought to lead to a delay in the diagnosis of other pathologies and multi-drug-resistant tuberculosis. This study aims to compare the diagnostic yield of fluoroscopy (C-arm) guided transpedicular biopsy done by orthopaedicians v/s CT guided biopsy done by radiologists in cases of Koch's spine.

Materials and methods: The study involved 60 consented patients with a clinico-radiological diagnosis of Koch's spine randomly divided into 2 groups for biopsy 1) CT-guided biopsy to be done by radiologists 2) C-arm guided biopsy to be done by orthopedicians and results were compared.

Results: The use of CT-guided biopsy and C-arm guided biopsy in the diagnosis of Koch's spine is increasing taking into consideration of increasing MDR TB. We got a positive answer in 70% of cases via CT-guided biopsy and 53.33% via C-arm guided biopsy. Detection of MDR TB on GeneXpert was the commonest diagnostic feature with a comparatively low rate of positive AFB smear and histopathology.

Conclusion: Results of C-arm guided biopsy are similar to CT guided biopsy with the latter being better.

Keywords: Koch's spine, Biopsy, Multi-drug resistant tuberculosis

Introduction

Tuberculosis is the 13th leading cause of death and the second leading infectious killer after COVID-19 (above HIV/AIDS) [1]. Koch's spine or spinal tuberculosis is one of the most crippling manifestations of extra-pulmonary tuberculosis. Spinal tuberculosis is the most common form of extra-pulmonary tuberculosis [2].

It most commonly involves the thoracic spine followed by the lumbar spine [3]. Haematogenous seeding from the primary foci is the most common mode of spread of spinal tuberculosis [4].

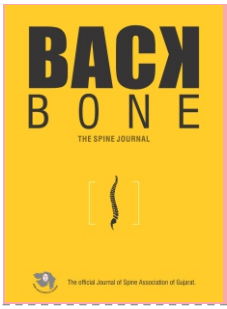
Clinical presentation depends on the site of the lesion; back pain is a common symptom [4]. Radiological findings are often non-specific, thus non-diagnostic.

Therefore, microbiological and/or histological evidence must be obtained. Owing to the lack of image-guided biopsy centres and the high prevalence of the disease, most of the patients are diagnosed and treated on clinical grounds. This practice was thought to lead to a delay in the diagnosis of other pathologies and multi-drug resistant tuberculosis.

The aim is to study the diagnostic yield of fluoroscopy-guided transpedicular biopsy done by orthopaedicians versus CT-guided biopsy done by interventional radiologists in cases of Koch's spine and compare results of smear examination; Acid fast bacilli (AFB) Zeihl Neelson stain v/s culture v/s GeneXpert.

Materials & Method

The study was conducted in a government tertiary care centre for 2 years and 6 months with a sample size of 60 patients (N=60).



[1]Department of Orthopaedics, Lokmanya Tilak Municipal General Hospital, Sion, Mumbai, Maharashtra, India.

Address of correspondence :
Dr. Meet Shah,
Department of Orthopaedics, Lokmanya Tilak Municipal General Hospital, Sion, Mumbai, Maharashtra, India.
E-mail: meetkshah29@gmail.com

Submitted: 25/08/2022; Reviewed: 19/09/2022; Accepted: 13/02/2023; Published: 10/04/2023

Back Bone: The Spine Journal (The Official Journal Of "Spine Association of Gujarat") | Available on www.backbonejournal.com | DOI: https://doi.org/10.13107/bbj.2023.v04i01.057

Table 1: Distribution of Study Subjects according to the Age (N = 60).

Age (Years)	No. of patients	Percentage
20-Nov	18	30
21-30	30	**50**
31-40	12	20
Mean (SD)	25.10 (6.48)	
Range	15-40	

Inclusion criteria

1) Age more than 12 years
2) Patients who presented with clinical symptoms and radiological features suggestive of infection
3) MRI reported as probable infection due to Koch's

Exclusion criteria

1) Cervical spine lesion
2) Significant neurological deficit that required urgent surgery
3) Infection over the skin puncture site
4) Pregnancy
5) Bleeding diathesis
6) Medically unfit for spinal biopsy
7) Appendicle Koch

Patients matching the inclusion criteria were selected and a written informed consent explaining all the complications was taken from all patients. A provisional clinical diagnosis of Koch's spine was made with help of a detailed clinical examination and radiological studies. Blood grouping and a complete hemogram was done. Bleeding time and clotting time was checked in all cases. All patients received pre and post-procedural antibiotic coverage.

Patients were randomly divided into 2 groups-

1. Patients who underwent c-arm guided biopsy: (n=30)
It was done by orthopaedic surgeons.
2. Patients who underwent CT-guided biopsy: (n=30)
It was done by interventional radiologists.

Under local anaesthesia, the biopsy was performed and 4 samples were obtained from each patient and were sent for microbiological and histopathological examination in the same hospital.

Four samples that were obtained were sent for each-

1) GeneXpert; a qualitative nested real-time polymerase chain reaction test for mycobacterium that can detect rifampicin resistance as well. Rifampicin resistance is considered multi-drug resistant tuberculosis (MDR TB)
2) Acid Fast Bacilli smear / Ziehl-Neelson staining
3) MGIT (mycobacteria growth indicator tube) culture
4) Histopathological examination (HPE)

Table 2: Distribution of Study Subjects according to the level of vertebra involved (N=60).

Diagnosis	No of patients	Percentage
D2-D5	7	11.7
D6-D9	14	23.3
D10-D12	**19**	**31.7**
D11-L2	8	13.3
L1-L5	11	18.3

In both the modalities, post-procedure vitals were monitored. Patients were followed up with the reports. For Genexpert, mycobacterium tuberculosis DNA detection was considered as positive result. For smear examination, the detection of acid-fast bacilli was considered as positive result. For MGIT culture, detection of growth in the culture tube was considered as positive result and for histopathological examination; necrotizing granuloma was considered as positive result. Data was collected and compared.

Observation and Results

From our study (N=60) it was found that the most commonly affected age group is 21-30 years with a mean age of 25.10 years with dorsolumbar junction (D10-D12) being the most common site involved in about 31.7% of the total population.

1) Results of Genxpert-
C-arm biopsy (n=30): Mycobacteruim TB detected in 16/30 patients i.e 53.33%
CT biopsy (n=30): Mycobacteruim TB detected in 19/30 patients i.e 63.33%
Difference- 10.33%
2) Results of smear staining (Zeihl Neelson staining)-
C-arm biopsy (n=30): AFB seen in 13/30 patients i.e 43.33%.
CT biopsy (n=30): AFB seen in 12/30 patients i.e 40%.
Difference – 3.33%
3) Results of MGIT culture-
C-arm biopsy (n=30): Growth seen in 15/30 patients i.e 50%
CT biopsy (n=30): Growth seen in 17/30 patients i.e 56.66%
Difference- 6.66%
4) Results of Histopathological examination (HPE)-
C-arm biopsy (n=30): Necrotizing granuloma seen in 14/30 patients i.e 45%

Table 3: Comparision of positive rates of different tests in C-arm guided biopsy and CT guided biopsy.

TEST	C-arm biopsy (n=30)	CT biopsy (n=30)	Difference %
Total positive *	16 (53.33%)	21 (70%)	16.67%
GeneXpert	16 (53.33%)	19 (63.33%)	10
Smear examination	13 (43.33%)	12 (40%)	3.33
MGIT culture	15 (50%)	17 (56.66%)	6.66
Histopathology	14 (45%)	13 (43.33%)	1.66

* Here total positive includes total number of patients who resulted positive in atleast one of the four tests.

CT biopsy (n=30): Necrotizing granuloma seen in 13/30 patients i.e 43.33%
Difference- 2.33 %

Discussion

Tuberculosis is the second greatest cause of mortality worldwide due to a single infectious agent [5]. Koch's spine is diagnosed based on clinical and radiological data. But with the emergence of resistant strains, it is recommended that a biopsy be performed whenever possible. Treatment for these patients depends on the accurate diagnosis utilizing histopathological and microbiological identification.

In this study, we got a positive detection in 70% of cases where a CT-guided biopsy was done and in 53.33% cases where a C-arm guided biopsy was done. However, all the patients with a positive diagnosis had Koch's spine radiologically. Francis et al. [6] reported the best results in literature so far, (82%) but had a comparative sample size of 29 via CT-guided biopsy. In a systematic review, Colmenero et al. [7] reported positive histopathology results ranging from 29% to 100% via CT-guided biopsy.

Thus overall detection rate is highest with GeneXpert and the lowest detection rate is with AFB smear. The discrepancy in success rates has been attributed to the operator's experience, accessibility of the lesion, microbacterial load, and giant cells in the specimen. Extra pulmonary tuberculosis has less bacterial load as compared to pulmonary tuberculosis. The only absolute contraindication is bleeding diathesis. The study has several limitations. Lesions are varied in location. The study involved multiple radiologists, multiple orthopedicians, multiple microbiologists, and multiple pathologists. Lesions predominantly located in the disc space were inaccessible. Hence transpedicular biopsy failed to provide a sample in such cases. The posterolateral approach is used for lesions located in disc space [8]; the transpedicular approach is an effective method of biopsy if the lesion is located in the posterior half of the vertebral body or if the pedicle is involved.

Continuous monitoring is not possible with a CT-guided biopsy whereas, with fluoroscopic monitoring, real-time positioning of the needle is possible in C-arm guided biopsy. In our study, no complications were encountered. All patients returned to their pre-biopsy level of daily activities the next day. The integrity of the walls of the pedicle must be protected to prevent the spread of infection inside the spinal canal and to prevent nerve root damage.

Conclusion

The use of biopsy in the diagnosis of Koch's spine is increasing taking into consideration of increasing MDR TB. From the above study, it can be inferred that CT-guided biopsy has better detection as compared to C-arm-guided biopsy in cases of Koch's spine. Also, the single best test for detection of MTB is found to be GeneXpert with early detection and hence early initiation of treatment.

C-arm guided biopsy is very economic and can be performed in remote places where the availability of an interventional radiologist or a CT scan machine is a problem with results nearly similar to CT-guided biopsy. Further studies are required for evaluation with a larger sample size for comprehension.

References

[1] https://www.who.int/news-room/fact sheets/detail/tuberculosis#:~:text=Worldwide%2C%20TB%20i%20the%2013th,all%20countries%20and%20age%20groups.

[2] Moon MS. Tuberculosis of the spine: controversies and a new challenge. Spine (Phila Pa 1976) 1997;22: 1791-7.

[3] Wang H, Li C, Wang J, Zhang Z, Zhou Y. Characteristics of patients with spinal tuberculosis: seven-year experience of a teaching hospital in Southwest China. Int Orthop 2012;36:1429-34.

[4] McLain RF, Isada C. Spinal tuberculosis deserves a place on the radar screen. Cleve Clin J Med 2004;71: 537-9.

[5] World Health Organization (WHO). Pakistan: stop tuberculosis [Internet]. Islamabad: WHO; 2014 [cited 2015 Apr 22]. Available from: http://www.emro.who. int/pak/programmes/stop-tuberculosis.html.

[6] Francis IM, Das DK, Luthra UK, Sheikh Z, Sheikh M, Bashir M. Value of radiologically guided fine needle aspiration cytology (FNAC) in the diagnosis of spinal tuberculosis: a study of 29 cases. Cytopathology 1999; 10:390-401.

[7] Colmenero JD, Ruiz-Mesa JD, Sanjuan-Jimenez R, Sobrino B, Morata P. Establishing the diagnosis of tuberculous vertebral osteomyelitis. Eur Spine J 2013;22 Suppl 4:579-86.

[8] Laurent Pierot and Anne Boulin, Percutaneous Biopsy of the thoracic and lumbar spine; Transpedicular approach under fluoroscopic guidance, Jan 1998.

Conflict of Interest: NIL
Source of Support: NIL

How to Cite this Article

Shah M, Rathod A, Punith K, Killekar R, Bharadwaj K | A Comparative Study About Diagnostic Yield of Fluoroscopy Guided Transpedicular Biopsy Done by Orthopaedicians v/s CT Guided Biopsy Done by Radiologists in Cases of Koch's Spine | Back Bone: The Spine Journal | April 2023-September 2023; 4(1): 28-31 | https://doi.org/10.13107/bbj.2023.v04i01.057