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Key Words

Percutaneous vertebral biopsy, paraspinous biopsy, C-arm guidance, spinal pathologies, transpedicular

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Received: 31 December 2023

Accepted: 25 January 2024

Published: 29 January 2024

Citation: Bismaya Sahoo, Chetan Raj Singh and Abhishek Malik 2024. Role of Fluoroscopic Guided Percutaneous Transpedicular Biopsy in Diagnosing Spinal Pathologies: A Comparative Study. Res. J. Med. Sci., 18: 243-251, doi: 10.59218/makrjms.2024.5.243.251

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Role of Fluoroscopic Guided Percutaneous Transpedicular Biopsy in Diagnosing Spinal Pathologies: A Comparative Study

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ABSTRACT

Evaluate the diagnostic efficacy of fluoroscopic-guided percutaneous transpedicular biopsy in individuals with persistent back pain and vertebral body anomalies. A retrospective observational study was conducted on persons who had a percutaneous vertebral biopsy from November 2021 to April 2022. A percutaneous transpedicular core biopsy was performed using C-arm guidance. The treatment was performed using a combination of local anesthesia and intravenous conscious sedation. The research population's demographics, which included 60% of males and 35% of individuals between the ages of 21 and 30, enabled the examination of age-related risk factors and sickness symptoms. According to information on the biopsy site, all biopsies were collected from the dorsal spine, 80% from the lumbar spine and 5% from the sacrum. The significance of this method as a less intrusive and efficient diagnostic tool for spinal illnesses was brought to light by the investigation of fluoroscopically guided percutaneous transpedicular biopsy. This procedure is more accurate, less invasive and needs less recuperation time, which benefits both physicians and patients.

INTRODUCTION

Tissue changes before commencing the appropriate therapy regimen. A biopsy is the only appropriate approach for diagnosis of spinal pathologies. The need of tissue diagnosis has increased significantly to ensure appropriate therapy, given the specificity, intricacy and risks associated with modern medicinal, surgical and radiation therapies^[1].

The percutaneous needle biopsy of the spine was initially introduced by Robertson and Ball in 1935^[2]. Descriptions of vertebral biopsy methods have been published in several studies^[3]. These operations have been carried out both with and without the assistance of radiography^[4-7] and CT guidance^[8-12]. A spine-related open transpedicular biopsy was performed by Fidler and Niers in 1990^[13]. The biopsy tract, hematoma, and lesion are all removed in one piece during the radical excision of tumors that follows. The transpedicular biopsy approach, as discussed by Fidler and Niers^[13], resulted in a shorter tract compared to the more commonly employed standard posterolateral method. This shorter and less obliquely oriented tract facilitates a more straightforward resection process^[14,15].

Layton *et al.*^[16] demonstrated that a modified vertebroplasty method may be used to the transpedicular route to get a biopsy from the disc space and both neighboring vertebral endplates. This vertebroplasty technique can be used to obtain a biopsy for suspected discitis or spondylodiscitis. On the other hand the research done in 1991 by Renfrew *et al.*^[17] suggested transpedicular biopsy of vertebral body lesion using CT guidance. Without using contemporaneous radiographic localization or fluoroscopic assistance, they inserted a needle blindly into the tumour region.

An increasing trend in recent years has been the use of a trocar or needle to diagnose different spinal diseases in the lumbar and thoracic areas^[17-20]. In a comprehensive review of relevant studies, including those by Kamet *et al.*^[21] Yang *et al.*^[22] Eugenio *et al.*^[23], Guo *et al.*^[24] and Wu *et al.*^[25] needle biopsies were conducted on a cohort of 128 patients. Among them, 247 individuals demonstrated diagnostic accuracy rates of 84% for primary tumors and an impressive 97% for metastatic cancer. Notably, 31 patients with spinal infections exhibited a diagnostic accuracy rate of 58%, aligning closely with the findings of our own research^[26].

Furthermore, the study included 171 patients undergoing needle biopsies for bone tumors under the guidance of imaging techniques. In this subgroup, 151 patients were presented with conditions promoting bone destruction, also guided by imaging techniques. The cumulative diagnostic accuracy for these cases reached 77%, reinforcing the consistency of our research outcomes with the broader scientific literature.

According to Nourbakhsh *et al.*^[27], fluoroscopy was not statistically significant when it came to the slightly better accuracy and adequacy of CT scan compared to fluoroscopy for percutaneous vertebral biopsy (92.6% versus 90.1-90.2% versus 88.1%, respectively). However, a different research discovered that although the accuracy of a spinal biopsy guided by fluoroscopy was greater than that of a CT guided biopsy, the difference was not statistically significant ($p = 0.731$). This is consistent with current research, which indicates no appreciable difference between the two methods^[28-29].

Zindrick *et al.*^[30] reported that the T5 vertebra has the narrowest pedicle, measuring an average transverse outer diameter of five mm for the pedicle isthmus, whereas the L5 vertebra has an average of eighteen mm. In research by Kornblum *et al.*^[31], they discovered a reduced accuracy rate in the thoracic spine, although CT guided biopsy showed promise in terms of sample adequacy. The first report of a CT guided closed biopsy of the spine using a Tru-cut needle was published by Adapon *et al.*^[32].

Percutaneous spinal biopsies may help treat a variety of spinal pathological disorders and provide an accurate diagnosis. The usefulness of its use in treating spinal diseases is extensively assessed in the literature^[33-34]. The use of larger needle sizes^[34,35] and the existence of osteolytic lesions^[36] are widely acknowledged in the field to be significant factors that boost the diagnostic rate in percutaneous CT-guided spinal biopsies. However, there is disagreement and dubious research about the connection between gender^[37] and spinal level^[38]. No study has examined the diagnostic success rates of different biopsy techniques.

Unlike iliac crest biopsy trocars, however, there is still much debate on the ideal trephine size the use of CT or fluoroscopic guidance and the amount of vertebral bone core that should be provided. Percutaneous transpedicular trocar biopsies using a 3.1 mm Jamshidi trocar under fluoroscopy guidance must be evaluated for safety, the quality of the histologic samples, and the diagnostic efficacy. Thus, in order to examine potential factors that could influence the success rate of spinal biopsies, we used our own database of biopsy cases in this study.

MATERIALS AND METHODS

Study Area: Over the course of time, the study was conducted at the Orthopaedics. The study included participants who exhibited symptomatic vertebral body lesions. The usefulness of fluoroscopic-guided percutaneous transpedicular biopsy in the diagnosis of spinal diseases was investigated in this comparative study. To ensure the consistency and relevance of the patient cohort, certain inclusion and exclusion criteria were used. Individuals fulfilling the requirements for

enrolment often have clinical signs that point to spinal disorders and have abnormalities of the vertebrae found by non-invasive imaging within a certain amount of time. Study participants underwent local anaesthesia and sedation before undergoing percutaneous vertebral biopsies under C-arm supervision. Exclusion criteria may have included previous biopsies or therapies at the target site, as well as substantial medical comorbidities or bleeding issues that would make the surgery contraindicated. To assess the safety and diagnostic accuracy of percutaneous transpedicular biopsy for spinal diseases under fluoroscopic supervision, a representative sample was carefully chosen.

Data Collection: A sample size of 20 patients was used to capture important clinical findings once the relevant historical data was obtained. Based on the data gathered, it was found that 60% of the patients were male and the remaining 40% were female. To get a preliminary clinical assessment, a thorough neurological, orthopaedic, and clinical examination was carried out. Numerous non-radiological investigations were carried out, including the Mantoux test, serum alkaline phosphatase and erythrocyte sedimentation rate (ESR). In every case, clotting and bleeding times were measured. In every case, anteroposterior and lateral views were used to precisely target the lesion region while taking radiographs. A group of patients had CT (computed tomography), MRI (magnetic resonance imaging), chest radiography and abdominal ultrasonography. A provisional radiological diagnosis was developed because of the clinical examination data and the documentation of many imaging modalities.

Preparation for Biopsy: All the participants were given the information they needed to understand the research and its importance for treating their unique conditions. From every individual, formal consent was obtained. Each patient received pre-procedural antibiotic prophylaxis.

Equipment's Required: A trocar equipped with a cannula that precisely measures 2 mm inside diameter is used in this novel diagnostic approach to get a suitable tissue sample for examination. A biopsy performed with assurance that enough tissue of the right amount and quality has been chosen. Accuracy and guiding are further enhanced by the inclusion of a C-arm vision enhancer to the approach. Due to its ability to give patients a pleasant and secure posture during treatment the Relton Hall frame is used. It is also possible to find a vertebra's pedicle and determine the ideal entrance location using a bone awl, if handled carefully. This comprehensive approach puts the patient's health and safety first, regardless of the

accuracy of the diagnosis, by using cutting-edge tools and techniques.

The Technique: A computed tomography (CT) scan was conducted before the procedure to determine the pedicle size and the axial plane angulation of the targeted vertebra. The precise location of the lesion within the spine determined which pedicle to use for the vertical biopsy.

Procedure: During the biopsy operation, continuous monitoring of the needle trajectory was possible because to the utilisation of a C-arm image intensifier. The patients were positioned prone on a Hall frame, and radiographic imaging methods were used, particularly lateral and anteroposterior (A-P) imaging, to determine which vertebra was affected. To ensure precision the C-arm was carefully positioned in the anterior-posterior (A-P) view at an angle that matched the selected pedicle inclination for the biopsy operation. Until the "bull's eyes," or the pedicle's centre, were clearly visible on the monitor, the orientation was maintained.

The trocar's route was then meticulously identified using an image intensifier to make sure the pedicle's boundaries were not crossed and a bone awl was precisely positioned on the pedicle. A bone awl was used to make a small incision in the dermis and then a trocar fitted with a cannula was inserted at the designated spot. Once the trocar was removed the cannula was introduced through the pedicle into the targeted biopsy site, following anterior-posterior and lateral fluoroscopy to confirm precise placement.

The biopsy instrument caused compression of the connective tissue when it met the inner segments of the cannula during entry into the vertebral body. After that, biopsy samples were carefully removed for further macroscopic and microscopic examination from the cannula. Notably, from our personal experience with transpedicular biopsies, this method has continuously generated tissue samples with no failures. To get more tissue for diagnostic purposes the cannula may be reinserted and its alignment adjusted in various orientations if considered required.

Specimen Analysis

Microscopic Scanning: Following a comprehensive microscopic examination by the hospital's pathologist, the patient received expert post-operative treatment on the ward, which included round-the-clock monitoring. Over the course of this extended period, medical professionals diligently recorded the patients' vital signs to determine their stability and general well-being. In addition, a comprehensive neurological examination was carried out to accurately determine the patient's neurological state. The comprehensive

assessments made it possible to analyse the biopsy results and arrive at a definitive diagnosis, providing insight into the underlying condition. To get a more comprehensive picture of the patient's condition, further testing and consultation may have been required in situations where the diagnostic findings were equivocal. To decide on the best course of action, this could have required doing further experiments or consulting with experts.

Macroscopic Analysis: The specimen's quantity, length, and nature were all examined.

RESULTS

Patients were divided into several age groups for the purposes of the current study the numbers in brackets represent the number of instances that fall into each category. The use of stratification enabled a more comprehensive analysis of the study sample with respect to age. To comprehend the possible consequences of the illness under examination on various age groups, individuals must be categorized into discrete age cohorts. In addition the division of people into various age groups is crucial for customizing healthcare treatments and determining the probability of certain risk factors or outcomes that may be associated with an individual's age.

Table 1 presented a comprehensive demographic analysis of the research cohort, elucidating significant attributes like gender, age and biopsy location. The numerical values in the table denote the count of cases and their respective proportions. In relation to the distribution of gender, it is evident that 60% of the sampled population comprises men, while females constitute the remaining 40%. The analysis of gender distribution within the study's sample may provide significant insights into possible gender-related aspects relevant to the study's aims. The Table 2 classifies patients into several age ranges. The age group with the highest representation is those aged 21-30 years, accounting for 35% of the observed instances. This is followed by the age groups of 31-40 years (20%), 41-50 years (25%), 51-60 years (15%) and 61-70 years (5%). The age stratification used in this research provides valuable insights into the representation of various age cohorts, which is essential for evaluating age-specific risk factors and changes in the manifestation of diseases. Finally, the table displays data on the biopsy site, revealing that dorsal biopsies were present in all four instances, lumbar biopsies account for 80% of the total 15 cases and sacral biopsies were seen in the sole case. The provided information has substantial importance in comprehending the distribution of biopsy sites and its pertinence to the aims of the

research, perhaps offering insights into the location-specific characteristics of spinal diseases. Specimen analysis.

The findings of the examination of specimens obtained from persons with symptomatic vertebral body lesions are shown in Table 2. Every row inside the table represents a distinct specimen, presenting information on the quantity of specimens, the length of each specimen measured in millimeters and the characteristics of the specimens. The examination uncovers a diverse range of discoveries among the specimens. Certain specimens are classified as "fragile bits," suggesting that they may comprise tiny and delicate fragments. The lengths of the specimens exhibit considerable variation, encompassing a broad range of measures spanning from 5-25 millimeters. The specimens constantly possess the characteristics of being cylindrical in shape and composed of a solid material, as shown by their descriptive description as "Cylindrical, Solid." It is worth mentioning that certain specimens are designated as having "Multiple fragile bits," which signifies the existence of several delicate fragments inside those samples. The dimensions of these specimens generally fall within a similar range as the others but with some degree of fluctuation.

Biopsy Diagnosis: Fig. 1 presented an in-depth analysis of the observed diagnoses within the population being studied. Based on the cases under examination, tuberculosis (TB) has emerged as the prevailing diagnosis, with a total of eight identified occurrences. This detailed portrayal highlights the significance of tuberculosis (TB) in the context of spinal disorders. The illness needs careful monitoring and therapy to have a substantial influence on spinal health. Moreover, it was shown that there were other spinal disorders associated with TB but with a lower incidence rate. Each of the following disorders, namely Aneurysmal Bone Cyst, Giant Cell Tumor, Paget's disease and Multiple Myeloma, was associated with a single

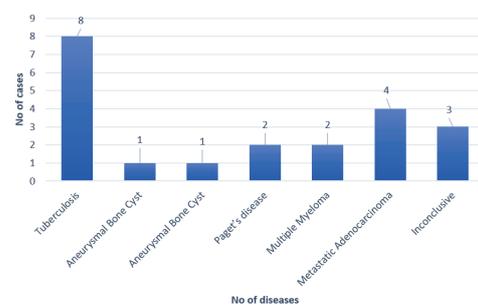


Fig. 1: Graphical Illustration of incidence rate associated with spinal disorders

Table 1: Demographic table

Gender	Frequency	Percentage
Male	12	60
Female	8	40
Age		
21-30	7	35
31-40	4	20
41-50	5	25
51-60	3	15
61-70	1	5
Biopsy site		
Dorsal	4	100
Lumbar	15	80

Table 2: Specimen analysis of individuals who had symptomatic vertebral body lesions

Samples	No. of specimens	Specimen length (mm)	Specimen nature
1	1 Fragile bit	-	-
2	1 Fragile bit	5	Cylindrical, Solid
3	Multiple fragile bits	-	Solid, cylindrical
4	1 fragile bits	-	Cylindrical, Solid
5	1 fragile bit	13	Solid, cylindrical
6	1 fragile bit	12	Cylindrical, Solid
7	2 fragile bits	10,25	Solid, cylindrical
8	1 fragile bit	25	Cylindrical, Solid
9	1 fragile bit	10	Solid, cylindrical
10	2 fragile bits	14	Cylindrical, Solid
11	1 fragile bit	2,10,15	Solid, cylindrical
12	3 fragile bits	5	Cylindrical, Solid
13	2 fragile bits	10	Solid, cylindrical
14	2 fragile bits	10, 20	Cylindrical, Solid
15	1 fragile bit	20	Solid, cylindrical
16	1 fragile bit	10	Cylindrical, Solid
17	1 fragile bit	10	Cylindrical, Solid
18	Fragile bits	-	-
19	1 fragile bit	5	Cylindrical, Solid
20	1 fragile bit	22	Solid, cylindrical

incidence. The diseases span a broad spectrum of pathological conditions, including both benign and malignant tumors, as well as metabolic bone disorders. The presence of these several ailments underscores the complex nature of spinal diagnoses and underscores the imperative of customized and specialized therapy for each unique patient.

DISCUSSIONS

To fully assess the diagnostic efficacy of fluoroscopically guided percutaneous transpedicular biopsy for spinal diseases, it is crucial to carefully evaluate and compare it with other diagnostic methods^[39]. The utilization and appropriateness of percutaneous transpedicular biopsy may be better comprehended with the incorporation of these supplementary approaches^[40]. A noninvasive imaging method that provides very detailed pictures of the spine and the tissues around it is magnetic resonance imaging, or MRI. Since magnetic resonance imaging (MRI) allows for clear viewing of tumors, spinal infections, and herniated discs, it is a vital diagnostic tool. The precise location, size and characteristics of lesions may be established without using invasive methods. Cross-sectional pictures are produced using computed tomography (CT) scans, which use X-rays to provide important information on bone structures and some soft tissue issues^[41].

Clinical evaluation, patient’s medical background, and physical inspection remain crucial in identifying spinal diseases in conjunction with imaging techniques. Bone scans and electrodiagnostic exams, such as electromyography and nerve conduction investigations, provide crucial data on bone integrity and nerve activity, while blood tests may give valuable information on inflammatory or tumor-related indicators. To effectively address the requirements of patients with distinct manifestations of spinal disease, clinicians and healthcare providers should assess the diagnostic accuracy, invasiveness, cost-effectiveness and overall usefulness of fluoroscopically guided percutaneous transpedicular biopsy in comparison to alternative approaches. This comprehensive approach ensures that individuals with spinal diseases get the most optimal diagnosis and therapy.

Utilizing real-time image guidance via fluoroscopy allows for the collection of more precise and accurate tissue samples. As a result, the likelihood of making a mistake on a sample and the need for exploratory procedures are both reduced, which is especially beneficial when dealing with small or deeply rooted lesions in the spinal area. Moreover, the percutaneous technique is preferred because of its superior safety profile for the patient, as well as its capacity to accelerate the healing process and reduce treatment-related problems. On the other hand, open surgical biopsies involve significant cutting of tissue and longer stays in the hospital, which raises the chances of consequences like infection and discomfort after the operation, in comparison to the described procedure. The fluoroscopically guided percutaneous transpedicular biopsy is a minimally invasive treatment that may often be conducted on an outpatient basis. This method allows for quick sampling of spinal infections, tumors, and inflammatory diseases, hence permitting a thorough diagnostic investigation.

The present research provided an overview of the demographic features of persons who had symptomatic vertebral body lesions. Out of the sampled population, men constitute 60% while females account for the remaining 40%. An analysis of the gender distribution in the research sample may provide significant insights on gender-related characteristics that are relevant to the study's aims. The table classifies patients into several age categories. The age group with the highest incidence is persons aged 21-30, accounting for 35% of the observed instances. The ensuing age cohorts are as follows: persons aged 31-40 years comprise 20% of the population, those aged 41-50 years make up 25%, those aged 51-60 years represent 15% and individuals aged 61-70 years form 5% of the population. The use of age stratification in this research produces noteworthy results for the

representation of various age groups, hence enabling the evaluation of age-specific risk factors and changes in the manifestation of disease^[40].

Unlike the current study, which examines the demographic characteristics and gender distribution of individuals with symptomatic vertebral body lesions, a separate study conducted by Patel *et al.*^[43] specifically investigates the impact of socioeconomic factors on the occurrence and outcomes of spinal disorders. The research undertaken by Patel *et al.*^[43] examined many socioeconomic variables, including income, education, and healthcare accessibility, to gain insights into how they affect the incidence and management of spinal illnesses. The present research provides useful insights into the gender and age distribution among individuals with vertebral body lesions. Patel *et al.* research, in contrast, specifically investigates the socioeconomic determinants that impact spinal health. The research found a notable association between those with lower socioeconomic position and limited access to healthcare and the occurrence of spinal diseases, along with the resulting delays in diagnosis and treatment. This study enhances the current research by providing a deeper knowledge of how socioeconomic characteristics contribute to the development of spinal health concerns, hence enriching the demographic data.

The demographic analyses of both studies show comparable characteristics among patients with symptomatic vertebral body lesions. The gender distributions of the studied populations are shown in both studies. The first research consisted of a male majority, with 60% of participants being male, while the remaining 40% were female. In the second study conducted by Chandrasekaran *et al.* men comprised 60% of the cases, while females accounted for 40% of the total. Both studies demonstrate an interest in investigating the impact of spinal disorders on gender, therefore their emphasis on gender demographics is to be expected. In order to conduct a more thorough examination of the impact of age on vertebral body lesions, both studies categorized people into many age groups. The first study revealed that those aged 21-30 were the most significant demographic segment, accounting for 35% of the overall population. The second research study also emphasizes the age distribution of the participants, revealing that 16 out of the total occurrences were seen among individuals aged 20-50. By categorizing individuals into older and younger age groups, researchers were able to examine possible factors and disparities in spinal illnesses based on age in both studies.

Sezer *et al.*^[44] found that the age group between 21 and 30 years had the highest number of reported cases of vertebral body lesions, making up 35% of the total occurrences. Similarly, the second study focuses

on the age distribution of the participants, specifically noting that there was a total of 16 instances seen among people aged 20-50. Researchers use age groups as crucial tools to examine potential causes and variations in spinal disorders across different age categories.

Both studies provide a more detailed analysis of how age may affect the development, manifestation, or occurrence of spinal problems by categorizing the data into different age groups. This technique facilitates academics and healthcare practitioners in acquiring a more profound understanding of risk variables that are unique to certain age cohorts. Hence, this information may be used to create treatment strategies and interventions that are tailored to cater to the specific requirements of certain age groups^[45]. Nevertheless, the age range is more precisely defined in a subsequent study conducted by Chandrasekaran *et al.* which indicates that the lowest age is 22 and the greatest age is 68. This information provides a clearer understanding of the age distribution of the group under investigation.

In contrast to the previous two studies, the examination conducted by Mireles-Cano *et al.* (2008) provides information about the demographic characteristics of patients who have symptomatic vertebral body lesions^[46]. The research had a cohort of 30 patients, with a mean age of 58.1 years, of whom 15 were female participants. The research specifically investigated the average duration of clinical development, which was found to be 7±4 months. The primary focus was on identifying the causal organisms. Among the specimens obtained using fluoroscopy-guided percutaneous transpedicular biopsy, 40% accurately identified the organisms, while 46.6% of the specimens collected through posterolateral endoscopy achieved correct identification. The predominant bacterium identified in patients who received both percutaneous and endoscopic treatments was *Staphylococcus aureus*, whereas *Escherichia coli* was discovered in individuals who underwent either method. The kappa test revealed a high level of agreement (kappa = 0.86) between the two approaches, and there was complete consensus (100%) in identifying bacterial species. The results of all research consistently highlight the importance of demographic and clinical factors in interpreting symptomatic vertebral body lesions in different patient groups^[46].

The present research performed a thorough analysis of the observed diagnoses within the target population. After analyzing the cases, tuberculosis (TB) has been found the most common diagnosis, with a total of eight occurrences. This comprehensive depiction emphasizes the importance of tuberculosis (TB) in the context of spinal diseases. The disorder requiring

meticulous monitoring and correction may significantly impact the health of the spine. The present study conducted a comprehensive analysis of diagnosed illnesses among the selected population, highlighting the high incidence of tuberculosis (TB) as the prevailing diagnosis, with a total of eight cases discovered. This finding emphasizes the importance of tuberculosis (TB) in the field of spinal illnesses, emphasizing the necessity for meticulous surveillance and intervention owing to its potential significant influence on spinal health.

Like this, Smith *et al.*^[47] conducted a study using epidemiological techniques to examine the connection between tuberculosis (TB) and its consequences on spinal health, with an emphasis on areas with a high TB incidence. In the study, the researchers looked at a much larger sample size and specifically focused on spinal issues related to tuberculosis (TB). In regions with a high TB incidence, spinal abnormalities associated with tuberculosis (TB) were much more common, according to research by Smith *et al.*^[47] This result emphasizes the need of putting improved TB management measures into place to lessen the likelihood of spinal problems. Iizuka *et al.* study from 2023, on the other hand, focused on a different population-young people who play football-and employed several diagnostic techniques, including whole-body dual-energy x-rays, lumbar magnetic resonance imaging (MRI), measurements of muscle tension, and analyses of bone mineral density. The study population, including 69 people, exhibited a noteworthy incidence of bilateral lumbar bone stress injuries (BSI) at a rate of 26.3%. Odds ratios (OR) supporting these connections showed that the disorders were associated with asymptomatic bone marrow edema (BME) and the developmental stage of lumbar vertebral bodies. Furthermore, the results of the research showed a significant relationship between the sacral slope and the bilateral lumbar bone strength index (BSI) in relation to lumbar lordosis (LL)^[48].

The research presents a novel biopsy technique that uses fluoroscopy-guided percutaneous transpedicular biopsy and offers several significant advantages over other diagnostic methods for assessing spinal diseases^[49]. This technique's primary characteristic is its minimal invasiveness, which reduces the risks associated with more invasive medical procedures. The cost efficiency of this methodology's use increases its accessibility to a wider range of patients. Additionally, the use of fluoroscopy provides real-time and dynamic visualization, which raises the degree of accuracy throughout the biopsy process. Moreover, the ability to accurately target different vertebral bodies makes precision sampling easier, which helps with the identification and characterization of spinal disorders. The study

emphasizes age stratification and demographic data, which highlights the significance of these findings by making it easier to assess risk variables specific to various age groups and variations in disease presentation. This biopsy approach is often a useful tool in the evaluation of spinal diseases due to its relatively less invasive, cost-effective, and accurate diagnostic methodology.

Limitations: This research focuses mostly on the diagnostic aspect of spinal disorders. Although it does provide important demographic data, it does not go into detail on the efficacy of the therapy or the long-term clinical outcomes. Therefore, it is plausible that the methodology may not provide an exhaustive understanding of the comprehensive management of spinal disorders. It's also critical to consider any possible limitations on the study's sample size and length. Increasing the sample size will probably improve the study's statistical power and generalizability by including a wider variety of people. Furthermore, it is noteworthy that the comparatively little duration of data collection would not sufficiently capture extended patterns or variations in the presentation of spinal illnesses over an extended duration. Moreover, the study's inability to compare the percutaneous transpedicular biopsy approach with other diagnostic modalities limits our ability to assess its relative benefits or drawbacks in certain clinical settings.

CONCLUSION

In summary, the examination of "fluoroscopic-guided percutaneous transpedicular biopsy" as a diagnostic technique for spinal illnesses has shown the important role this procedure plays as a less invasive and successful one. The benefits of this technique over open surgical biopsies, such as increased precision, less invasiveness, and quicker patient recuperation, make it a good choice for medical professionals as well as patients. Still, there is potential for more study and developments in imaging technology to enhance and broaden the scope of uses for this approach. Future potential study may focus on process standardization, evaluating the technique's efficacy in more complicated spinal disorders and doing more studies into its efficiency.

ACKNOWLEDGMENT

In the commencing of my research paper, I would want to sincerely thank everyone who has helped me along the way. The author wishes to extend their sincere gratitude to their research supervisor for giving us the chance to write this research paper on the subject of "Role of fluoroscopic guided percutaneous transpedicular biopsy in diagnosing spinal pathologies

A comparative study." This opportunity allowed me to conduct a thorough investigation and gain new knowledge. I also want to thank my parents and other family members from the bottom of my heart for their unwavering financial and emotional support. And lastly, a huge thank you to all my pals who helped me finish my research paper by offering great guidance and ideas. They benefited from collaboration and helpful feedback. I'd want to congratulate everyone who has already received recognition.

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