

## First-Line Application of Open Biopsy Method in Osteosarcoma Prognosis - The Contraindications

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### Abstract

*Osteosarcoma is a rare condition with a complex treatment commonly reported in teen age children. With the present standard treatment protocols, one could achieve up to 76% overall survival rate in any case of localized osteosarcoma. By attenuating the major risk factor like open biopsy that is routinely followed in osteosarcoma cases, the failure incidents could be reduced considerably. Although good number of research findings provide sufficient information on the serious risks involved in opting for open biopsy and, on the availability of safer biopsy methods like core needle biopsy, the open biopsy is being followed as a first-line standard treatment protocol for osteosarcoma in many cases. The immediate need for abandoning the open biopsy method as a first-line application in the treatment protocol of osteosarcoma is discussed.*

**Keywords:** Contraindication; Biopsy risks; Bone cancer; Tumor seeding; Metastasis.

### Introduction

Osteogenic sarcoma, or osteosarcoma, is the most common primary malignant bone tumor, making up about 20% of all cases, primarily affects the extremities in majority of cases (75%) before the age of 25 (Greenwood et al., 2024). Despite advancements in cancer therapies, its prognosis remains poor due to its aggressive nature and early propensity for metastasis including synchronous metastasis (Paulraj & Ramalingam, 2023). Biopsy is one of the fundamental protocols in osteosarcoma therapy and it constitutes the final stage of evaluation, completing the tumor staging (Guedes et al., 2021). The goal of biopsy is to obtain diagnostic tissue while minimizing morbidity, limiting potential tumor spread, and avoiding interference with future treatments. Techniques that have evolved to accomplish these goals include open surgical biopsy, core biopsy, and fine-needle aspiration (Kasraeian et al., 2010). Although open (incisional) biopsy has long been the gold standard for soft tissue mass diagnosis, with a diagnostic accuracy of 94% to 99% (Huvos, 1995; Aboulafia, 2008; Rougraff, 2009) it has many disadvantages such as, higher surgery cost (\$4321.25 to \$7234.00), carries a complication rate of up to 16%, including hematoma, tumor spread, and wound problems that may interfere with adjuvant treatments (Aboulafia, 2008; Rougraff, 2009; Skrzynski et al., 1996). In spite of various risks and serious complications involved (Paulraj & Ramalingam, 2023; Kund, 2014; Mankin et al., 1982; Mankin et al., 1996), the so called 'gold standard' open biopsy is being commonly practiced for treating osteosarcoma including some developed countries like USA and Canada (Burke et al., 2023).

There may be several reasons to opt for open biopsy by them. They are: (a). Lack of suitable infrastructure facilities to perform CNB; (b). lack of trained technical team which are needed for consulting for performing CNB; (c). mainly concerned for accurate or higher accuracy of biopsy test results; (d). giving more priority for the diagnostic accuracy than the risks in OB; (e). considering the disadvantages of the open biopsy as the acceptable minor issues as a part the treatment protocol; (f). Fetching more income while performing the service of open biopsy; (g). lack of knowledge on the availability of the latest developments in biopsy techniques; (h). technically easier than CNB and finally, (i) lack of strict guidelines on which biopsy type should be followed for osteosarcoma cases.

It is therefore essential to bring out the deleterious effects of the open biopsy with specific reference to bone cancers like osteosarcoma so as to avoid open biopsy by the onco-surgeons as a routine first-line biopsy method in the case of osteosarcomas and, to decide on the alternative biopsy techniques which are least risky thereby reducing the fatality rates of osteosarcoma patients.

### Aims of Biopsy and the Types

#### Aim of Bone Biopsy

Bone biopsies aim to facilitate definitive pathological diagnoses while minimizing complications, limiting potential tumor seeding and avoiding interference with subsequent therapies (Kubo et al., 2018).

## Types of Bone Biopsy

Alexiev (2025) has given a summary of all major types of biopsies after analysing various research reports as follows:

There are 3 types of bone biopsies: open (surgical) biopsy, core needle biopsy and fine needle aspiration biopsy. Biopsy of a suspected primary bone neoplasm must yield enough tissue to permit complete histopathological evaluation, including grading.

**Open biopsy (OB):** (Persson & Rydholm, 1979).

OB can be categorized as either incisional (a portion of the mass or lesion is removed) or excisional (the entire tumor is removed). Incisional biopsy is generally recommended for suspected benign lesions that can be treated definitively at the time of biopsy or in cases where greater volumes of tissue may be required than can be obtained with a needle biopsy in order to perform special staining or molecular diagnostics.

Incisional biopsies are also often performed when a needle biopsy result is nondiagnostic; for incisional biopsies, the incision and dissection tract are planned such that they can be excised during the definitive limb salvage procedure.

Excisional biopsy may be performed through the reactive zone that surrounds the tumor (termed marginal excision) or with a cuff of healthy tissue (primary wide excision).

## Core Needle Biopsy (CNB)

This uses a large needle to remove a cylinder of tissue and the most common type of needle biopsy used for bone tumors. It is a safe, reliable and accurate procedure and yields diagnostic information in a high proportion of patients (Wu et al., 2008; Adams et al., 2010; Kasraeian et al., 2010).

## Fine Needle Aspiration (FNA) Biopsy

It uses a very thin needle on the end of a syringe to obtain a small amount of fluid and some cells from the tumor. It is a safe, reliable and accurate procedure and yields diagnostic information in a high proportion of patients (Wu et al., 2008).

## Latest Developments in Biopsy

Despite some recent advances, novel biomarkers for OS diagnosis, prediction of response to therapy, disease progression and chemoresistance, are urgently needed. In this connection Liquid biopsy represents a promising tool with the potential to be rapidly translated in the clinical practice (Raimondi et al., 2017).

In addition to diagnosing bone metastases, liquid biopsies may detect risk factors and enable preventative treatments. Liquid biopsies have emerged as a potent non-invasive tool for analyzing tumor phenotype, progression, and drug resistance and guiding treatment decisions in bone sarcomas and metastases. Approval of the FDA is expected for adopting this method (Andreas et al., 2024).

Of these types of biopsies presently only the OB and the CNB are being used for osteosarcoma bone tumors (Kubo et al., 2018).

## Merits and Demerits of the Open and Core Needle Biopsies

Chetan (2022) who compared CNB with OP following 18 criteria and concluded that CNB in skilled hands, offers significant advantages over and therefore, it is the preferred method for obtaining tumor tissue samples. Nevertheless, there may be some situations where an open biopsy procedure could be the more suitable option (Table, 1). However, he has not discussed supportive scientific evidences to substantiate his inference.

## Pre-Biopsy Plan

The diagnosis of OS requires a multidisciplinary approach, integrating clinical evaluation, imaging, and laboratory testing (Cengiz et al., 2024; Brar et al., 2025). Esmaelinejad-Ganji et al. (2019) recommend that tumor surgeries should be carried out in a special setting to prevent any spread to or contamination of other sites by the tumor.

According to Exner et al. (2017) a tactical plan should be developed which evaluates the necessity, the risk, the approach and finally defines the technique of biopsy most likely to achieve a representative result in the clinical case. In developing this technical approach, the pitfalls should be anticipated, i.e. inadequate sampling, difficulty of pathological interpretation and contamination. Prior to biopsy, a hypothesis should be formed about the most likely diagnosis and a differential diagnosis. These deliberations should consider whether the lesion is a primary benign or malignant tumour, a metastasis, a haematological problem or an infection.

## Discussion

It is seen that both open surgical and core needle biopsies are the common biopsy techniques followed for osteosarcoma although both have their own merits and demerits. However, the core needle biopsy with CT or US guidance is a standard and preferred procedure over open biopsy in most the majority of MSK biopsies in most sarcoma centers (Vasilevska et al., 2020). Burke et al. (2023) have similar observations based on 12 countries data and concluded that CNB was the more common biopsy modality in the PARITY study in most countries. However, OB was more common in the U.S. and Canada (Burke et al., 2023).

Although Misaghi et al. (2018) claim that CNB has replaced the traditional open approach, mainly because of the reduced risk of contamination of the surgical bed with tumor cells but also due to lower cost and decreased recovery time, OB is commonly followed in many countries (Burke et al., 2023; Paulraj & Ramalingam, 2023).

There are no clear reasons to select the types of biopsies to be performed for bone cancer like osteosarcomas (Traina et al., 2015). Does the availability of either expertise or facilities in treatment centre decide the biopsy type? In case of availability of both expertise and advanced facilities to perform both biopsies are available in the same centre, which biopsy, OB or CNB, is to be chosen? Unless a standardised protocol for choosing a particular biopsy is developed and made available, the oncologists will have their individual random choice.

In this connection it is pertinent to note the NCCN's (National Comprehensive Cancer Network) advice that, clinicians to refer osteosarcoma patients to a tertiary care center with osteogenic sarcoma specialists and interprofessional teams for optimal management of this condition (Greenwood et al., 2024). But it is seldom being followed in many countries due to lack of adequate facilities, expertise and awareness (Paulraj & Ramalingam, 2023).

There are many scientific studies which compared the relative efficacy of both OB and CNB in terms of their accuracy and safety. But they fail to analyse which (either OB or CNB) should be more important in patients' survival point of view. Many of the studies simply mention that the risks involved in OB is relatively more than CNB while the diagnostic accuracy in CNB is lesser than the OB. In the patient's survival point of view which method may be compromised is not clear. The pertinent questions here are: whether the higher risk factors in the case of OB is not a serious issue comparing its higher diagnostic accuracy? And secondly, whether the lesser diagnostic accuracy in CNB is not a serious issue comparing its low risk factors? According to Traina et al. (2015) the current literature has not clarified the optimal biopsy technique for the diagnosis of bone and soft-tissue tumors.

These questions could be answered after comparing the relative importance of diagnostic accuracy and risk factors of both OB and CNB in terms of better survival value based on the available relevant scientific reports.

#### **Does the lesser diagnostic accuracy in the CNB technique really a matter of concern?**

Relative accuracies of both OB and CNB have been numerically compared by several authors based on secondary analysis of prospective study.

Although OB is known for higher diagnostic accuracy, the CNB too has a high diagnostic yield and accuracy, comparable with OB results (Pohlig et al., 2012; Kiatisevi et al., 2013).

Burke et al. (2023), who made a recent study on the efficacy of the both OB and CNB with Four hundred and sixty-four patients and data collected from 48 sarcoma centers in 12 countries have come to the conclusion that there were no differences in surgical site infection or oncological outcomes between the two groups at 1-year follow-up. However, Patients undergoing OB had longer operative times, more excised tissue, and lower rates of primary closure, but this did not translate to differences in infection rates or oncological outcomes, including local recurrence. There is no mention of any incidence of seeding and relapse / recurrences in any of the two biopsies within a one year follow up in this study.

Pohlig et al. (2012) retrospectively evaluated the diagnostic accuracy of core needle biopsy in comparison with open biopsy in 77 patients with bone and soft tissue lesions. The results showed the difference in diagnostic accuracy for core needle biopsy (92.9%) was not statistically significant compared with the open biopsy result (98%).

Traina et al. (2015) compared percutaneous biopsy of bone or soft tissue MSK tumors with open biopsy in their review of 17 articles including biopsies guided by CT, US, and MRI, but also percutaneous biopsies without imaging guidance. They came to the conclusion that the current literature has not clarified the optimal biopsy technique for the diagnosis of bone and soft-tissue tumors. However, core needle biopsy is usually preferable to incisional biopsy because of the low risk of contamination and the low cost. In addition, the use of imaging guidance increases the diagnostic accuracy of musculoskeletal biopsies, as a result, the difference in accuracy between the two biopsy types was not statistically significant. They proposed that if the result of a percutaneous biopsy is nondiagnostic, a small incisional biopsy should be performed.

Kubo et al. (2018) who made analysis with 32 studies comprising 7209 musculoskeletal lesions to estimate the diagnostic accuracy of core needle biopsy and open biopsy, reported that diagnostic accuracy was significantly lower for core needle biopsy than for surgical biopsy. They came to the impression that radiologists were better core needle biopsy operators than surgeons. They suggested that core needle biopsy should be performed by expert radiologists and that surgical biopsy should be performed if diagnosis following core needle biopsy does not match the clinical presentation and radiographic findings.

In order to improve the diagnostic performance of core needle biopsies of bone and soft tissue tumors, (Wu et al., 2008) proposed that a minimum of four samples for soft tissue tumors and three samples for skeletal tumors to achieve an ideal diagnostic yield after examining the diagnostic performance of core needle biopsies of bone and soft tissue tumors in 151 patients.

The diagnostic accuracy of core needle biopsy (CNB) is greater than 90 % for both bone and soft tissue neoplasms and should be considered the first-line procedure (Saifuddin & Clarke, 2014).

Taupin et al. (2016) who specifically analysed the accuracy of CNB for the diagnosis of osteosarcoma with a retrospective analysis of 73 osteosarcoma patients who underwent CNB, reported no complication due to CNB and recommended that even in the presence of sclerotic tumors, CNB should be the first line diagnostic test for suspected osteosarcomas, pending performance by a well-trained radiologist and reading by a specialized pathologist.

Sadeghian & Sinha (2024) who studied Comparative Accuracy of Core-Needle and Open Biopsy in Diagnosis, Subtyping, and Grading of Head and Neck Sarcomas involving ninety patients, reported that although the accuracy in open biopsy was superior to needle biopsy, the difference between these two types of biopsy strategy was not statistically significant apart from grading, which was significantly better in open biopsy. Despite this superiority, open biopsy is less recommended as a first approach due to being more invasive.

Besides, subtyping may not change the treatment approach significantly as the main decision will be based on the size, location, grading, nodal disease, and distant metastases (Shuman et al., 2015; Spalek et al., 2020). Also, the decision for post-operative chemoradiotherapy can be made based on the final histopathology report and is not reliant on diagnostic biopsy results.

Vasilevska et al. (2020) are of the view that, although the open biopsy is still considered the gold standard for the biopsy of MSK lesions, core needle biopsy can replace it in most cases, with similar accuracy and a low complication rate. Today, CT-or US-guided core needle biopsy is widely considered a standard diagnostic procedure that can obviate the use of open biopsy in most cases (Issakov et al., 2003; Mitsuyoshi et al., 2006).

Office-based core needle biopsy for diagnosis of malignant musculoskeletal neoplasms has high diagnostic and accuracy rates without associated complications (Adams et al., 2010).

Pramesh et al. (2001) have reported an accuracy of 96.9% among bone tumor patients who had a confirmed final diagnosis with CNB and none of the patients had any major complications.

Image-guided MSK biopsies are safe, minimally invasive, and effective procedures with lower risks compared with open biopsies and offer high diagnostic results. They play a pivotal role in patient workup and management and should always be approached by a multidisciplinary team (Le et al., 2010).

In the past, open biopsy had been considered the gold standard. However, the diagnostic accuracy of core needle biopsy (CNB) is greater than 90% for both bone and soft tissue neoplasms and should be considered the first-line procedure (Saifuddin & Clarke, 2014).

According to Kamat et al. (2024) the lower accuracy in the literature for the core biopsy is because of inexperienced hands or improper planning.

Cengiz et al. (2024) have recently made a scientific study on the advantages of CNB, based on the calculation of the sensitivity, specificity, positive predictive value (PPV), negative predictive value (NPV), and diagnostic accuracy rates according to the compatibility of results. Their study has shown that the CNBs performed by orthopedic specialists have a high diagnostic power (96% for bone-derived lesions; 92% for soft tissue-derived lesions) and concluded that Percutaneous core needle biopsy is highly effective and reliable in diagnosing bone and soft tissue tumors. According to them for lesions originating from the bone, a fluoroscopy-guided percutaneous Jamshidi needle biopsy performed by an orthopedist has a higher diagnostic accuracy (96%) than CT-guided percutaneous Jamshidi needle biopsy performed by a radiologist (88.9%). They further suggested that managing patients by a team using a multidisciplinary approach will increase diagnostic success.

**Answer:** Based on the above overall findings it may be concluded that although the diagnostic accuracy of the CNB is comparatively little lesser than the OP, this deficiency has very little concern as it could be effectively used by multidisciplinary approach that can obviate the use of open biopsy in most cases.

### **Do seeding, recurrence and survival rates in sarcoma patients due to OB and CNB a real concern?**

A comparative account of seeding contamination, recurrence and other problems while using OB and CNB for sarcomas have been discussed by various authors as follows:

Barrientos-Ruiz et al. (2017) compared the tract seeding differences between core needle ultrasound (US) or computed tomography (CT)-guided biopsies and open biopsies of MSK sarcomas, by pathologic examination of the resected biopsy tract, and they found statistically significant differences (32% of the open biopsy tracts and only 0.8% of the percutaneous biopsy tracts were contaminated with tumor cells).

Regarding survival rates of the patients seeding contamination, they (Barrientos-Ruiz et al., 2017) reported that the local recurrence-free survival was longer for patients without contaminated tracts (mean, 107 months; 95% CI, 74-141 months) than for those with biopsy tract seeding (mean, 11 months; 95% CI, 1-20 months;  $p < 0.001$ ) and concluded that open biopsies were associated with an increased risk of tumoral seeding of the biopsy site, and tumoral seeding was associated with an increased risk of local recurrence.

According to Sadeghian & Sinha (2024), open biopsy is less recommended as a first approach due to being more invasive. Based on some recent studies, Pohligh et al. (2012) reported that complication rates for OB occur up to 17% whereas, in CNB they were up to 7.4% only.

In a retrospective study by UyBico et al. (2012) including 363 imaging-guided biopsies of bone and soft tissue lesions, there were no cases of local recurrence because of breaching the anatomical compartments, vital structures, or biopsy tract seeding.

Saghieh et al. (2010) retrospectively evaluated the local recurrence of a skeletal sarcoma in 10 patients who underwent core needle biopsy, and the biopsy tract was not surgically removed. None of the procedures was associated with local recurrence.

According to Torben (2019) tumor seeding has also been reported after ultrasound guided radiofrequency ablative procedures. He has suggested a modified and popular co-axial biopsy technique which reduce the seeding problem in CNB technique.

Guedes & Nakagawa (2024) in their recent review reported that the disadvantages associated with OB procedure include greater potential for contamination and a higher rate of local tumor recurrence, as well as complications related to the surgical wound (16%).

Overall complication rates due to biopsy vary, approximately 1% in CT-guided core biopsy and as high as 16% in open biopsy (Maciel et al., 2014).

The potential complication rate for percutaneous bone biopsy is <5% with a suggested threshold of 2% (Gupta et al., 2010; Veltri et al., 2017; Le et al., 2010; Filippiadis et al., 2018).

Paulraj & Ramalingam (2023) have brought out a case study of an osteosarcoma case substantiating the effect of OB in seeding and synchronous metastasis of osteosarcoma.

Brown et al. (2022) have presented the case of a 16-year-old adolescent girl with a distal femur osteosarcoma who developed an open biopsy site ulceration and infection.

**Answer:** Seeding and subsequent recurrent and metastasis of any bone cancer due to CNB were seldom reported whereas, in the case of OB, seeding followed by recurrence and metastasis especially, of bone cancers were reported frequently. Therefore, it is a serious concern while opting for OB for bone related cancers.

### **Mechanism of Biopsy Seeding and its Influence on Metastasis**

Unlike cells of normal tissue, cells in the cancer cell mass, because of the loss of cohesion, and the capacity of these cells to emigrate and colonize through lymph fluid or blood, it is sometimes very easy for them to dislodge from a tumor mass during biopsy or surgical procedures (Farshid, 2002). Tumors that are biopsied or otherwise 'interfered with' have a higher incidence of metastasis than tumors that were removed in an untouched block (Farshid, 2002).

### **Risk of Major Injuries Inflicting Tumour Metastasis**

It is evident that open biopsy involves major surgical procedures which result in major injury effects (Chetan, 2022). Demicheli et al. (2008) have given a historical perspective of various reports supporting surgery induced tumour growth and metastasis. However, such reports had generally been dismissed as anecdotal until more recent evidence demonstrated that the surgical operation may generate a permissive environment for tumour growth (Tohme et al., 2016). Alieva et al. (2018) in their recent review summarized the current literature regarding local, systemic, and secondary side effects of surgical interventions on tumor progression and dissemination. Even minor surgical trauma can influence physiological process that might promote post operative metastatic spread and tumor recurrence (Ferguson et al., 2004; Alieva et al., 2018).

Bacci et al. (1998) who made retrospective study of 540 osteosarcoma patients, reported that the quality of the biopsy and length and effectiveness of primary chemotherapy were reported as the main risk factors for local recurrence. According to them (Bacci et al., 1998) the diagnosis of osteosarcoma was always made by histologic examination of specimens, taken from an open biopsy. They also observed that the first signs of systemic spread of the tumor were observed in 3 times more patients with local recurrence than in patients who relapsed without local recurrence. However they failed to correlate open biopsy or surgical injury with possible seeding and local recurrence in their study.

### **Latest Developments in Biopsy**

Despite some recent advances, novel biomarkers for OS diagnosis, prediction of response to therapy, disease progression and chemoresistance, are urgently needed. Liquid biopsy represents a promising tool with the potential to be rapidly translated in the clinical practice. (Raimondi et al., 2017).

In addition to diagnosing bone metastases, liquid biopsies may detect risk factors and enable preventative treatments. Liquid biopsies have emerged as a potent non-invasive tool for analyzing tumor phenotype, progression, and drug resistance and guiding treatment decisions in bone sarcomas and metastases (Mavrogenis, et al., 2024; Ma et al., 2024).

### **Conclusions**

Although the CNB comparatively has a little lower diagnostic accuracy than the OP, this deficiency has very less concern as it could be effectively managed by multidisciplinary approach.

The very first option while deciding the method of biopsy should be the CNB and the OB is to be seldom recommended as a first approach due to it is being more prone to seeding, recurrence and metastasis.

CT/ US/ Florescent-guided CNB should be considered as a standard diagnostic procedure that can obviate the use of open biopsy in most cases of osteosarcoma.

OB should be preferred only when CNB (performed in an experienced center) cannot accurately diagnose a soft tissue tumor and likely to affect the prognosis seriously.

Diagnostic accuracy in the case of CNB is a least concerned factor whereas, the risky factors associated with OB are of serious concerns as far as in osteosarcoma patients' prognosis point of view. Therefore, opting for OB as the first-line biopsy method may be avoided by all means as it is a contraindication as far as osteosarcoma is concerned!

### **Recommendations**

The complexity of management of bone and soft tissue malignancies necessitates an organized, structured approach involving many disciplines. There are advanced sarcoma treatment centres like The University of Michigan Comprehensive Cancer Centre, Multidisciplinary Sarcoma Tumor Board and Clinic. Such specialised centres need to be established worldwide (Siegel et al., 2015).

Country-specific databases of physicians specialized in sarcomas and other rare tumors can also be created and become publicly available in an effort to facilitate second opinion referrals from low-income countries.

There are good number of research reports as highlighted in this paper, which guide the oncologists for choosing an opt biopsy method indicating the pros and cons of the each of the biopsy types. The application and value of such scientific

findings should be highlighted in international conferences / seminars.

It is high time for the international advisory bodies like NCCN, to take up this issue seriously and to issue strict guidelines on this matter and to make it reaching worldwide. This will be an important step in saving the precious life of many osteosarcoma patients particularly the teen-aged patients who are mostly affected by this dreaded disease.

**Table 1:** Comparison of open biopsy (OB) vs. core needle biopsy CNB)

Sl. No	Points of comparison	Open Biopsy	Core Needle Biopsy
1	<i>Nature of procedure</i>	Invasive	Minimally-invasive
2	<i>Size of incision</i>	Depends on depth of tumor. Deeper the disease, larger the incision required to reach it. Ranges from about 3 – 4 cm. up to several cm.	Does not depend on depth of tumor. Size of incision always remains the same; about 5 mm. In-fact, therefore, deeper the tumor, more is the advantage of needle biopsy.
3	<i>Tumors in complex locations like spine, pelvis, sacrum, etc.</i>	As these lesions are deep and in difficult regions, open biopsy is highly unsuitable.	Most effective procedure for these lesions. Can be done under image guidance like CT scan, etc.
4	<i>Quantity of tissue obtained</i>	Substantial amount of tissue can be obtained.	Less tissue obtained – however, adequate for a skilled pathologist.
5	<i>Drain tube placement following the procedure</i>	May be needed; to drain the collected blood (haematoma)	Never required
6	<i>Blood loss</i>	May be significant	Generally, limited
7	<i>Ease of procedure</i>	Easy	Requires skill
8	<i>Reliability</i>	Excellent	Excellent in skilled hands
9	<i>Safety</i>	Excellent	Excellent
10	<i>Possibility of fracture following the procedure</i>	Likely; especially if the biopsy is from the diaphyseal region (shaft area) of a long bone	Very unlikely
11	<i>Speed</i>	Takes much longer time than needle biopsy	Few minutes
12	<i>Anaesthesia</i>	May need general or regional anaesthesia	Most often, done under local anaesthesia
13	<i>Recovery from procedure</i>	May take a few hours to a day	Almost immediate
14	<i>Post-procedure pain</i>	May be significant	Usually tolerable, and abates quickly.
15	<i>Hospital stay</i>	May need a few hours or a day's stay in the hospital	Usually an OPD based procedure. Does not generally need hospital admission.
16	<i>Local tissue contamination</i>	Significant	Very limited
17	<i>At final surgery</i>	More skin and normal tissue is lost while removing the biopsy scar and track.	Minimal loss of skin and normal tissue as the biopsy scar and track is small.
18	<i>Cost of procedure</i>	Much more as compared to Core Needle Biopsy	Very reasonable

Adopted from: Chetan (2022):

<https://bonetumorclinic.in/blog/core-needle-biopsy-vs-open-biopsy/#:~:text='Core%20Needle%20Biopsy'%20in,made%20between%20OB%20and%20CNB>: Accessed on 1-1-2026.

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