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Surgical treatments of metastatic bone disease of the hip joint: A scoping review protocol

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Surgical treatments of metastatic bone disease of the hip joint: A scoping review protocol

Li Mao^{1,2†}, Jiling Liu^{1,2†}, Dagang Feng^{1*}, Jianyuan Tang^{1*}

ABSTRACT

Introduction Metastatic disease of the hip causes severe pain and is a serious threat to the patient's motor function. Surgery is required, but the actual efficacy is unclear and there are many concerns for both patients and doctors. The purpose of this protocol is going to conduct a scoping review for helping decisions of intended audience.

Methods and analysis This scoping review will be conducted according to the framework proposed by Arksey and O'Malley and reported in accordance with PRISMA-ScR criteria. To answer our research questions, we will search Chinese and English databases using appropriate search terms, comb through clinical studies on surgical procedures for metastatic bone disease of the hip and incorporate visual charts and graphs to provide a comprehensive analysis and evaluation of the literature according to the criteria for basic characteristics, interventions, and outcome indicators. Enseignement Superieur (ABES) . Protected by copyright, including for uses related to text and data mining, AI training, and similar technologies.

STRENGTHS AND LIMITATIONS

⇒Our scoping review will demonstrate the importance of hip-related surgery in bone metastatic disease, and provide reference evidence for patients, doctors, and policymakers.

⇒The following guidelines are used: Preferred Reporting Items for Systematic Reviews and Meta-Analyses Extension for Scoping Reviews.

 \Rightarrow There will be no language restrictions to include as much evidence as possible.

 \Rightarrow Implant and supply cost will be included in the data collection form.

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 \Rightarrow The risk of bias will not be assessed.

Ethics and dissemination

Since the data are publicly available, no ethical approval or participant consent is required. The results of the review will be published in an open-access peer-reviewed journal and presented at national and international conferences.

Keywords

hip joint, bone metastatic disease, surgery, scoping review protocol

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INTRODUCTION

The global incidence of cancer continues to rise each year. According to the Global Cancer Statistics 2020 of World Health Organization (WHO), cancer led to nearly 10 million deaths in 2020. The most common newly diagnosed cancers include breast cancer (2.26 million cases), lung cancer (2.21 million cases), colorectal cancer (1.93 million cases), and prostate cancer (1.41 million cases)[1]. Despite the impact of the pandemic in 2023, lung cancer, colorectal cancer, breast cancer, and prostate cancer still top the list of cancers. Moreover, their recurrence and metastasis rates remain exceedingly high[2]. The skeleton is a common site for metastases from breast, prostate, lung, or other cancers, with approximately 70% of cases of metastatic bone tumors originating from these sources[3]. Patients diagnosed with bone metastasis most

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commonly originate from breast cancer (36%), lung cancer (16%), and colorectal cancer (12%) [4]. Compared to patients in the pre-metastatic stage, bone metastasis significantly increases the risk of death and decreases survival rates[5]. Most individuals with bone metastasis may experience skeletal-related events (SREs), including hypercalcemia, spinal cord injuries, pathological fractures, and uncontrolled pain[6].Patients in the early stages of metastasis may not easily detect the condition, mistaking it for other bone or neurological diseases, delaying treatment. Lower limbs, especially the hip joint, are weight-bearing bones essential for upright activities and walking. Impaired mobility and bedridden conditions can lead to various bone complications such as muscle atrophy and lower limb thrombosis, severely impacting patients' daily lives and quality of survival. Moreover, untreated pathological fractures and additional diseases can evolve into critical conditions, endangering patients' life safety[7]. The treatment principles for metastatic bone disease primarily depend on the type of primary tumor and the organ involved. Local radiotherapy, systemic use of bone resorption inhibitors, synthetic metabolic agents, and radioisotopes are recognized as the main modes of treatment[8]. However, if the scope of bone metastasis is extensive, there is a risk of fractures or if pathological fractures have occurred, immediate stabilization or reconstruction of the joint is necessary while removing highly affected bone and surrounding tissues[9].

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Surgical treatment can effectively relieve tumor compression symptoms on surrounding nerves and blood vessels, alleviate cancer pain, and restore limb structure and musculoskeletal function[10]. The core of surgical treatment lies in effectively determining the timing and method of surgery, striving to address potential pathological fractures before fractures or paralysis occur, preventing emergencies. While surgeries for metastatic bone disease are often palliative for

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systemic diseases, compared to non-surgical treatments such as radiotherapy, chemotherapy, anti-angiogenic therapy, and bone-modifying agents, surgical interventions are insufficient to relieve pain, rebuild function, and improve survival quality[11]. Additionally, surgery provides histological diagnosis of bone metastatic lesions, facilitating further comprehensive treatment of the disease. Among these surgical procedures, the hip joint becomes a challenging point for treatment due to its unique anatomical position[12], especially involving lesions in the hip socket and pelvic stress conduction area. These joints bear enormous stress when standing under load, making them the most common site for pathological fractures[13]. Periarticular metastatic damage often causes gradual displacement of the femoral head towards the top and inner side of the acetabulum, sometimes resulting in acute acetabular fractures or collapse; despite effective radiotherapy, this site may experience local bone dissolution and necrosis, leading to pathological fractures or joint collapse[14]. In these critical situations, surgical treatment is necessary, and hip joint surgery itself is complex[15]. The most used classification system for periacetabular bone metastases is the Harrington classification[16]. If the acetabular bone damage is small and the displacement of the femoral head is not apparent, the ordinary bone cemented total hip arthroplasty can achieve good results[17]. However, if extensive acetabular bone damage occurs and the remaining part is difficult to prevent the displacement and loosening, ordinary total hip replacement is not suitable[18]. As bone cement can withstand pressure but not shear stress[19] [19], fixation methods such as liners, Steinmann pins, hollow screws, and composite bone cement are used to bridge bone defects when necessary[20, 21].Percutaneous acetabulum three-column hollow screw fixation technology can restore acetabular strength and weight-bearing function in some patients.

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Meanwhile, patients, their families, and doctors often face a dilemma about whether hip surgery should be performed. Apart from facing the complexity of hip joint surgical procedures, they must also consider whether the primary tumor and the patient's physical condition may add the significant risks of surgery, and whether the value of procedures truly outweigh the risks[22]. Therefore, researchers advocate for a multidisciplinary collaborative treatment (MDT), which involves the rational and planned development of individualized comprehensive treatment plans for patients. They call for clear division of labor among orthopedic, oncology, and radiotherapy physicians[23]. However, we hope to gain a comprehensive understanding of the specific outcomes, and postoperative adverse reactions of these patients, determining whether the surgery truly extends their survival or improves their quality of life.

Numerous researchers have conducted clinical studies on surgical treatment for hip joint metastatic diseases[24]. Regarding the overall analysis of this clinical evidence, reviews primarily focus on systematic reviews and meta-analyses, with limitations on study types[25]. A scoping review is a method for determining the literature scope or coverage of a topic, clearly indicating the available literature and the quantity of studies, providing an overview of their focus[26]. Its purpose is not to excessively assess the study design, methods, and reporting quality of clinical research. Different from previous reviews and systematic evaluations, considering the current research goals, this review will integrate existing clinical studies. Its results will present the characteristics of clinical studies more comprehensively and intuitively using visual graphics, describing the current status, existing issues, and future research directions in clinical studies on surgical treatments for hip joint metastases. Although clinical research evidence and reviews have been published, reports on scoping reviews are scarce. For such surgical procedures, this scoping

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review will consider the balance between patients' unmet needs, benefits, and risks, providing clinical evidence support for clinicians' and patients' decision-making.

Review questions

 This study aims to address the following questions: (i) What are the characteristics of existing clinical studies? For example, information about participants (P), interventions (I), comparisons (C), outcomes (O), and study designs. (ii) What recommendations do existing clinical studies provide for patients undergoing surgical treatments? (iii) Should these types of surgical procedures really be performed? Under what circumstances should they be conducted? (v) What impact does surgery have on patients' survival?

METHODS

Team composition

The research team comprises two specialized orthopedic surgeons and two specialized oncologists. Literature screening and information extraction will be independently conducted by two researchers within the author team, with any uncertainties or discrepancies resolved by senior researchers within the team and relevant clinical experts.

Protocol design

The scoping review protocol follows to the standards of Preferred Reporting Items for Systematic Review and Meta-Analysis Protocols (PRISMA-P) and PRISMA extension for scoping reviews (PRISMA-ScR)[27]. The review will be conducted according to the framework proposed by described by the Arksey and O'Malley[28]and the enhancements proposed by Levac et al[29]. This protocol was not prospectively registered in any literature review databases (e.g.,

PROSPERO) as it is not applicable.

Inclusion and exclusion criteria

Characteristics of participants Patients aged 18 and above undergoing hip joint related surgery due to bone metastatic diseases.

Concept The study will describe the status of surgical research on metastatic diseases of hip joint, focusing on the characteristics of clinical studies, existing issues, and future research directions. For such surgeries, this scoping review will also consider the balance between patients' unmet needs, benefits, and risks, providing clinical evidence support for doctors and patients' decision-making.

Context Patients may be in a poor overall condition under the burden of the malignancy, having undergone radiotherapy, chemotherapy, or other relevant treatments, or may be in advanced stages of the disease, facing severe conditions. Metastases in hip joint are common, causing severe pain and impacting the quality of life; osteoporosis in elderly individuals poses a significant risk of pathological fractures, threatening patients' life safety. Additionally, hip joint-related surgeries involve complex classifications, with more concerns in surgical interventions for pathological fractures.

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Types of sources There will be no restrictions on the methodology of the study, and the language is limited to Chinese and English. However, publications must consist of peer-reviewed papers or theses. To ensure journal publication quality, Chinese journals are limited to those indexed in the *Chinese Science Citation Database, Chinese Core Journals Guide,* or *Chinese Science and Technology Core Journals*. English journals can be indexed in the *Science Citation Index* (SCI) or *SCI-Expanded*.

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Excluded literature brief cases, articles without full-text availability, surgeries related to primary bone tumors, basic experimental studies, and evaluations that simultaneously assess other joint metastatic diseases or surgeries, among others. Exclusion criteria may be revised as the scoping review progresses. Discussions with other senior researchers in the team will be conducted when necessary to increase familiarity with the literature and record reasons for exclusion.

Search strategy

The literature search will be conducted from the following databases: English databases including Web of Science, PubMed, Cochrane Library, Embase, Medline, and Scopus; Chinese databases including China National Knowledge Infrastructure (CNKI, https://www.cnki.net/), SinoMed (http://www.sinomed.ac.cn/), Chinese Science Journals Database (VIP, https://qikan.cqvip.com/), and Wanfang Database (https://www.wanfangdata.com.cn/). Besides these formal searches, relevant references suitable for inclusion will also be considered. Grey literature may include guidelines, policies, protocols, reports, and papers from other resources. The team will collectively devise the search strategy. English search terms will employ relevant MeSh terms from PubMed. Given the various sites within the hip joint, specialized terms will be subdivided for MeSh terms searches[30]. The search timeframe will cover the period from the establishment of the database up to November 2023, and languages will be limited to Chinese or English. Refer to the additional file 1 for specific search strategies.

Study collection and extraction

Records from databases will be exported to reference management software (NoteExpress, version 3.5.0), where duplicate records will be removed. Subsequently, titles and abstracts will be screened to verify usability, and confirmation of journal type will be cross-checked against their

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official websites. Full-text retrieval will be conducted for those meeting the inclusion criteria, with reasons for exclusion of full-text articles duly recorded. The literature screening flowchart is

depicted in Figure 1.



Fig. 1. Flow diagram of the literature screening process.

Data will be extracted from the literature using an Excel spreadsheet (Excel 2013) to record and manage the data. During the protocol phase, a pilot text-based table has been developed to collect basic information from the included studies, encompassing: (i) General information: title, publication year, journal name, authors, primary tumor, follow-up time; (ii) Study design type; (iii) Publication details: diagnostic criteria, inclusion criteria, exclusion criteria, sample size, participant information, demographic or descriptive data (e.g., age, gender); (iv) Intervention measures: types of surgeries; (v) Results and adverse events: (e.g., surgical parameters, patient or implant survival rates, functional status, postoperative revisions, and complications); (vi) Implant and instrument cost analysis.

A preliminary data extraction table will be piloted on the first five articles to ensure consistency in the extraction process. Any necessary modifications to the data extraction table will be made and documented accordingly. Not all items may be applicable to each study. If essential information is

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found to be unattainable during this process, the literature will be excluded. Table 1 shows the data extraction template. Data extraction form No. General information Title Journal Authors Publication year Country Registration Method Study design Diagnostic criteria Inclusion criteria Exclusion criteria Sample size Population Patient's age Primary malignancy Location of the bone lesion Duration of the observation Intervention Type of operation Duration of the operation Estimated blood loss

Outcomes and adverse events	Functional status
	Implant survival
	5-year overall survival rate
	Safety indicators
	Adverse events
Others	Implant and supply cost

Table 1. Data extraction form template.

Results analysis and summary

The results will be presented through descriptive statistical analysis, utilizing visual charts to analyze quantitative and qualitative data for comparison. Evidence will be presented in various formats (such as narrative, visual aids, tables) contingent upon the type of data analysis performed. For instance, line or bar graphs will be generated by Origin to depict the publication years of the studies, and python will be used to produce bubble charts related to outcome indicators. Finally, these statistical findings will be discussed and explored.

DISCUSSION

With cancer prevalence escalating globally, it is increasingly acknowledged as a common and chronic disease. Concurrent advancements in treatment methods and technologies have significantly prolonged the survival of cancer patients. As cancer patient care transitions into a chronic disease management model, emphasis on improving the quality of life becomes crucial. While patients benefit from increased survival, the risks of bone metastasis and SREs also rise. These complications change the quality of survival and may reduce overall survival (OS).

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Treatment of the tumor itself leads to systemic calcium and bone loss, for instance, estrogen deprivation in women with breast cancer and men undergoing androgen deprivation therapy (ADT) accelerates bone turnover, leading to a decrease in bone mineral density (BMD) and an increase in fracture incidence by 40-50%[31]. Bone metastases are found in most elderly patients because of bone pain or pathologic fractures, which are often confused with benign pathology because of the prevalence of degenerative disease and osteoporosis in these patients. Radiation therapy is the treatment of choice for localized bone pain, but in many patients, the pain is widespread and difficult to localize, while others may experience recurrence of bone pain after radiation therapy. In addition, osteolysis after radiotherapy is more likely to lead to pathologic fractures and collapse. The hip joint, as a major weight-bearing bone, is more prone to degenerative fractures than ordinary bones. Most appendicular metastases tend to occur in the pelvis and femur. In all long bone metastases, more than half of the pathologic fractures occur in the proximal femur[9] because the loads on the trochanter of the femur are greater than any other part of the long bone and can be up to six times the body weight. Retrospective studies have shown [32] that the extent of bone destruction around the femoral trochanter, even if small lesions, is associated with a high risk of fracture, and that lesions located in the center of the long bone have a lesser effect on bone strength, whereas eccentrically growing foci lead to an increased risk of fracture. Pathologic fractures around the hip are influenced by several factors, and the importance of surgical treatment is obvious in this patient population. Considering the primary disease and the overall physical condition, many patients and families forgo surgical treatment when they weigh the cost and value of treating the primary tumor and the hip-related surgery; even doctors may counsel against surgery because they are concerned about whether the unknown postoperative survival will be

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sufficient for patient' recovery of motor function, or whether postoperative complications will shorten the patient's survival. Overall, are these types of surgeries underestimated?

This study aims to answer this question by conducting a scoping review of the current clinical research. Despite previous consensus among experts on treating bone metastasis, it was often focused on a specific tumor's bone metastatic diseases, failing to emphasize specific surgeries related to the hip joint. Like other types of reviews, a scoping review comprehensively identifies and analyzes all clinical studies without quality assessments, using strict and transparent methods. Scoping reviews are beneficial when the primary objective is to establish a comprehensive understanding of a disease and its treatment and when there's heterogeneity in the existing literature. For our research questions, compared to other literature review methods, the scoping review is more suitable and hasn't been extensively explored within this patient population. The intended audience for the study's results includes researchers, institutional policymakers, clinicians, and patients.

Abbreviation

SREs: skeletal related events

MDT: multiple disciplinary treatment

PRISMA-P: Preferred Reporting Items for Systematic Review and Meta-Analysis Protocols PRISMA-ScR: PRISMA extension for scoping reviews

OS: overall survival

ADT: androgen deprivation therapy

BMD: bone mineral density

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Author contributions

All authors contributed to the study's conception and design. Material preparation, data collection, and analysis were performed by LM and JLL, the first draft of the manuscript was written by LM and JLL, JYT and DGF edited and approved the final manuscript. All authors read and approved Lie the final manuscript.

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Competing interests

The authors declare no conflict of interest in the publication of this article.

Availability of data and materials

All data generated or analyzed during this study will be included in the published articles.

Ethics and dissemination

Since the data are publicly available, no ethical approval or participant consent is required. The results of the review will be published in an open-access peer-reviewed journal and presented at

national and international conferences.

Patient and public involvement

Patients and/or the public were not involved in the design, or conduct, or reporting, or

dissemination plans of this research.

Patient consent for publication

Not applicable.

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1 2	Data	extraction form				
3	No.		1	2	3	4
4 5 6 7	General information	Title Journal Authors Publication year				
8 9 10 11 12 13	Study design	Country Registration Method Diagnostic criteria Inclusion criteria Exclusion criteria				
14 15 16 17	Population	Sample size Patient's age Primary malignancy Location of the bone lesion				
18 19 20 21	Intervention	Duration of the observation Type of operation Duration of the operation Estimated blood loss				
22 23 24 25 26	Outcomes and adverse events	Functional status Implant survival 5-year overall survival rate Safety indicators				
27 28 29 30	Others	Adverse events Implant and supply cost				
J 1						

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Proposed search strategy to search PubMed.

#1 (((((((((((((((((((((()) joint[MeSH Terms])) OR (acetabulofemoral joints[Title/Abstract])) OR (hip joints[Title/Abstract])) OR (acetabulofemoral joint[Title/Abstract])) OR (acetabulum[MeSH Terms])) OR (acetabulums[Title/Abstract])) OR (cotyloid cavity[Title/Abstract])) OR (cotyloid cavities[Title/Abstract])) OR (acetabula[Title/Abstract])) OR (acetabulas[Title/Abstract])) OR (femur head[MeSH Terms])) OR (femur heads[Title/Abstract])) OR (femoral heads[Title/Abstract])

#2 (((((Neoplasm Metastasis[MeSH Terms])) OR (neoplasm metastases[Title/Abstract])) OR (metastase[Title/Abstract])) OR (metastases[Title/Abstract])) OR (metastasis[Title/Abstract]) #3 (((((Neoplasm Metastasis[MeSH Terms])) OR (neoplasm metastases[Title/Abstract])) OR (metastase[Title/Abstract])) OR (metastases[Title/Abstract])) OR (metastasis[Title/Abstract]) #4 #1 AND #2 AND #3

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SCHOLARONE[™] Manuscripts

 Li Mao^{1,2†}, Jiling Liu^{1,2†}, Zhenxiao Yang^{1,2}, Chiheng Yan^{1,2}, Dagang Feng^{1*}

ABSTRACT

Introduction Metastatic disease of the hip causes severe pain and is a serious threat to the patient's motor function. Surgery is required, but the actual efficacy is unclear and there are many concerns for both patients and doctors. The purpose of this protocol is going to conduct a scoping review for helping decisions of intended audience.

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Keywords

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INTRODUCTION

The global incidence of cancer continues to rise each year. According to the Global Cancer Statistics 2022 from the International Agency for Research on Cancer, cancer led to 9.7 million deaths in 2022. The most common newly diagnosed cancers include lung cancer (2.5 million cases), breast cancer (2.3 million cases), colorectal cancer (1.93 million cases), and prostate cancer (1.47 million cases)¹. Despite the pandemic may have delayed cancer screening data, lung cancer, colorectal cancer, breast cancer, and prostate cancer still top the list of cancers. Moreover, their recurrence and metastasis rates remain exceedingly high². The skeleton is a common site for metastases. One study showed that approximately 70% of cases of metastatic bone tumors originating from breast, prostate, lung, or other cancers³. Further data revealed that some patients

with breast(36%), lung (16%) and bowel cancer (12%) were diagnosed with bone metastases as early as their initial diagnosis and treatment⁴. Compared to patients in the pre-metastatic stage, bone metastasis significantly increases the risk of death and decreases survival rates⁵. Most individuals with bone metastasis may experience skeletal-related events (SREs), including hypercalcemia, spinal cord injuries, pathological fractures, and uncontrolled pain⁶. Patients in the early stages of metastasis may not easily detect the condition, mistaking it for other bone or neurological diseases, delaying treatment. Lower limbs, especially the hip joint, are weight-bearing bones essential for upright activities and walking. Impaired mobility and bedridden conditions can lead to various bone complications such as muscle atrophy and lower limb thrombosis, severely impacting patients' daily lives and quality of survival. Moreover, untreated pathological fractures and additional diseases can evolve into critical conditions, endangering patients' life safety⁷. The treatment principles for metastatic bone disease primarily depend on the type of primary tumor and the organ involved. Local radiotherapy, systemic use of bone resorption inhibitors, synthetic metabolic agents, and radioisotopes are recognized as the main modes of treatment⁸. However, if the scope of bone metastasis is extensive, there is a risk of fractures or if pathological fractures have occurred, immediate stabilization or reconstruction of the joint is necessary while removing highly affected bone and surrounding tissues⁹.

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Surgical treatment can effectively relieve tumor compression symptoms on surrounding nerves and blood vessels, alleviate cancer pain, and restore limb structure and musculoskeletal function¹⁰. The core of surgical treatment lies in effectively determining the timing and method of surgery, striving to address potential pathological fractures before fractures or paralysis occur, preventing emergencies. While surgeries for metastatic bone disease are often palliative for systemic diseases,

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compared to non-surgical treatments such as radiotherapy, chemotherapy, anti-angiogenic therapy, and bone-modifying agents, surgical interventions are insufficient to relieve pain, rebuild function, and improve survival quality¹¹. Additionally, surgery provides histological diagnosis of bone metastatic lesions, facilitating further comprehensive treatment of the disease. Among these surgical procedures, the hip joint becomes a challenging point for treatment due to its unique anatomical position¹², especially involving lesions in the hip socket and pelvic stress conduction area. These joints bear enormous stress when standing under load, making them the most common site for pathological fractures¹³. Periarticular metastatic damage often causes gradual displacement of the femoral head towards the top and inner side of the acetabulum, sometimes resulting in acute acetabular fractures or collapse; despite effective radiotherapy, this site may experience local bone dissolution and necrosis, leading to pathological fractures or joint collapse¹⁴. In these critical situations, surgical treatment is necessary, and hip joint surgery itself is complex¹⁵. The most used classification system for periacetabular bone metastases is the Harrington classification¹⁶. If the acetabular bone damage is small and the displacement of the femoral head is not apparent, the ordinary bone cemented total hip arthroplasty can achieve good results¹⁷. However, if extensive acetabular bone damage occurs and the remaining part is difficult to prevent the displacement and loosening, ordinary total hip replacement is not suitable¹⁸. As bone cement can withstand pressure but not shear stress¹⁹, fixation methods such as liners, Steinmann pins, hollow screws, and composite bone cement are used to bridge bone defects when necessary²⁰⁻²¹.Percutaneous acetabulum three-column hollow screw fixation technology can restore acetabular strength and weight-bearing function in some patients.

Meanwhile, patients, their families, and doctors often face a dilemma about whether hip surgery

should be performed. Apart from facing the complexity of hip joint surgical procedures, they must also consider whether the primary tumor and the patient's physical condition may add the significant risks of surgery, and whether the value of procedures truly outweigh the risks²². Therefore, researchers advocate for a multidisciplinary collaborative treatment (MDT), which involves the rational and planned development of individualized comprehensive treatment plans for patients. They call for clear division of labor among orthopedic, oncology, and radiotherapy physicians²³. However, we hope to gain a comprehensive understanding of the specific outcomes, and postoperative adverse reactions of these patients, determining whether the surgery truly extends their survival or improves their quality of life.

Numerous researchers have conducted clinical studies on surgical treatment for hip joint metastatic diseases²⁴. Regarding the overall analysis of this clinical evidence, reviews primarily focus on systematic reviews and meta-analyses, with limitations on study types²⁵. A scoping review is a method for determining the literature scope or coverage of a topic, clearly indicating the available literature and the quantity of studies, providing an overview of their focus²⁶. Its purpose is not to excessively assess the study design, methods, and reporting quality of clinical research. Different from previous reviews and systematic evaluations, considering the current research goals, this review will integrate existing clinical studies. Its results will present the characteristics of clinical studies more comprehensively and intuitively using visual graphics, describing the current status, existing issues, and future research directions in clinical studies on surgical treatments for hip joint metastases. Although clinical research evidence and reviews have been published, reports on scoping reviews are scarce. For such surgical procedures, this scoping review will consider the balance between patients' unmet needs, benefits, and risks, providing

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clinical evidence support for clinicians' and patients' decision-making.

Review questions

This study aims to address the following questions: (i) What are the characteristics of existing clinical studies? For example, information about participants (P), interventions (I), comparisons (C), outcomes (O), and study designs. (ii) What recommendations do existing clinical studies provide for patients undergoing surgical treatments? (iii) Should these types of surgical procedures really be performed? Under what circumstances should they be conducted? (v) What impact does surgery have on patients' survival?

METHODS

Team composition

The research team consists of specialised orthopedic surgeons, oncologists, statisticians, and research assistants. Literature screening and information extraction will be independently conducted by two researchers within the author team, with any uncertainties or discrepancies resolved by senior researchers within the team and relevant experts.

Protocol design

The scoping review protocol follows the standards of Preferred Reporting Items for Systematic Review and Meta-Analysis Protocols (PRISMA-P) and PRISMA extension for scoping reviews (PRISMA-ScR)²⁷. The review will be conducted according to the framework proposed by the Arksey and O'Malley²⁸ and the enhancements proposed by Levac et al²⁹. This protocol was not prospectively registered in any literature review databases (e.g., PROSPERO) as it is not applicable.

Inclusion and exclusion criteria

Characteristics of participants Patients aged 18 and above undergoing hip joint related surgery due to bone metastatic diseases.

Concept The study will describe the status of surgical research on metastatic diseases of hip joint, focusing on the characteristics of clinical studies, existing issues, and future research directions. For such surgeries, this scoping review will also consider the balance between patients' unmet needs, benefits, and risks, providing clinical evidence support for doctors and patients' decision-making.

Context Patients may be in a poor overall condition under the burden of the malignancy, having undergone radiotherapy, chemotherapy, or other relevant treatments, or may be in advanced stages of the disease, facing severe conditions. Metastases in hip joint are common, causing severe pain and impacting the quality of life; osteoporosis in elderly individuals poses a significant risk of pathological fractures, threatening patients' life safety. Additionally, hip joint-related surgeries involve complex classifications, with more concerns in surgical interventions for pathological fractures.

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Types of sources There will be no restrictions on the methodology of the study, and the language is limited to Chinese and English. However, publications must consist of peer-reviewed papers or theses. To ensure journal publication quality, Chinese journals are limited to those indexed in the *Chinese Science Citation Database, Chinese Core Journals Guide,* or *Chinese Science and Technology Core Journals*. English journals can be indexed in the *Science Citation Index* (SCI) or *SCI-Expanded*.

Excluded literature brief cases, articles without full-text availability, surgeries related to primary

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bone tumors, basic experimental studies, and evaluations that simultaneously assess other joint metastatic diseases or surgeries, among others. Exclusion criteria may be revised as the scoping review progresses. Discussions with other senior researchers in the team will be conducted when necessary to increase familiarity with the literature and record reasons for exclusion.

Search strategy

The literature search will be conducted from the following databases: English databases including Web of Science, PubMed, Cochrane Library, Embase, Medline, and Scopus; Chinese databases including China National Knowledge Infrastructure (CNKI, https://www.cnki.net/), SinoMed (http://www.sinomed.ac.cn/), Chinese Science Journals Database (VIP, https://qikan.cqvip.com/), and Wanfang Database (https://www.wanfangdata.com.cn/). Besides these formal searches, relevant references suitable for inclusion will also be considered. Grey literature may include guidelines, policies, protocols, reports, and papers from other resources. The team will collectively devise the search strategy. English search terms will employ relevant MeSh terms from PubMed. Given the various sites within the hip joint, specialized terms will be subdivided for MeSh terms searches³⁰. The search timeframe will cover the period from the establishment of the database up to November 2023, and languages will be limited to Chinese or English. Refer to the additional file 1 for specific search strategies.

Study collection and extraction

Records from databases will be exported to reference management software (NoteExpress, version 3.5.0), where duplicate records will be removed. Subsequently, titles and abstracts will be screened to verify usability, and confirmation of journal type will be cross-checked against their official websites. Full-text retrieval will be conducted for those meeting the inclusion criteria, with

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reasons for exclusion of full-text articles duly recorded. The literature screening flowchart is depicted in Figure 1.

Data will be extracted from the literature using an Excel spreadsheet (Excel 2013) to record and manage the data. During the protocol phase, a pilot text-based table has been developed to collect basic information from the included studies, encompassing: (i) General information: title, publication year, journal name, authors, primary tumor, follow-up time; (ii) Study design type; (iii) Publication details: diagnostic criteria, inclusion criteria, exclusion criteria, sample size, participant information, demographic or descriptive data (e.g., age, gender); (iv) Intervention measures: types of surgeries; (v) Results and adverse events: (e.g., surgical parameters, patient or implant survival rates, functional status, postoperative revisions, and complications); (vi) Implant and instrument cost analysis.

A preliminary data extraction table will be piloted on the first five articles to ensure consistency in the extraction process. Any necessary modifications to the data extraction table will be made and documented accordingly. Not all items may be applicable to each study. If essential information is found to be unattainable during this process, the literature will be excluded. Table 1 shows the data extraction template.

Table 1. Data extraction form template.

Data extraction form						
No.		1	2	3	4	5
General information	Title					
	Journal					
	Authors					

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	Publication year
	Country
	Registration
Study design	Method
	Diagnostic criteria
	Inclusion criteria
	Exclusion criteria
	Sample size
Population	Patient's age
	Primary malignancy
	Location of the bone lesion
	Duration of the observation
Intervention	Type of operation
	Duration of the operation
	Estimated blood loss
Outcomes and adverse events	Functional status
	Implant survival
	5-year overall survival rate
	Safety indicators
	Adverse events
Others	Implant and supply cost

Results analysis and summary

The results will be presented through descriptive statistical analysis, utilizing visual charts to analyze quantitative and qualitative data for comparison. Evidence will be presented in various formats (such as narrative, visual aids, tables) contingent upon the type of data analysis performed. For instance, line or bar graphs will be generated by Origin to depict the publication years of the studies, and python will be used to produce bubble charts related to outcome indicators. Finally, these statistical findings will be discussed and explored.

Patient and public involvement

Patients and/or the public were not involved in the design, or conduct, or reporting, or dissemination plans of this research.

Ethics and dissemination

Since the data are publicly available, no ethical approval or participant consent is required. The results of the review will be published in an open-access peer-reviewed journal and presented at national and international conferences.

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DISCUSSION

With cancer prevalence escalating globally, it is increasingly acknowledged as a common and chronic disease. Concurrent advancements in treatment methods and technologies have significantly prolonged the survival of cancer patients. As cancer patient care transitions into a chronic disease management model, emphasis on improving the quality of life becomes crucial. While patients benefit from increased survival, the risks of bone metastasis and SREs also rise. These complications change the quality of survival and may reduce overall survival (OS).

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Treatment of the tumor itself leads to systemic calcium and bone loss, for instance, estrogen deprivation in women with breast cancer and men undergoing androgen deprivation therapy (ADT) accelerates bone turnover, leading to a decrease in bone mineral density (BMD) and an increase in fracture incidence by 40-50%³¹. Bone metastases are found in most elderly patients because of bone pain or pathologic fractures, which are often confused with benign pathology because of the prevalence of degenerative disease and osteoporosis in these patients. Radiation therapy is the treatment of choice for localized bone pain, but in many patients, the pain is widespread and difficult to localize, while others may experience recurrence of bone pain after radiation therapy. In addition, osteolysis after radiotherapy is more likely to lead to pathologic fractures and collapse. The hip joint, as a major weight-bearing bone, is more prone to degenerative fractures than ordinary bones. Most appendicular metastases tend to occur in the pelvis and femur. In all long bone metastases, more than half of the pathologic fractures occur in the proximal femur⁹ because the loads on the trochanter of the femur are greater than any other part of the long bone and can be up to six times the body weight. Retrospective studies have shown³²that the extent of bone destruction around the femoral trochanter, even if small lesions, is associated with a high risk of fracture, and that lesions located in the center of the long bone have a lesser effect on bone strength, whereas eccentrically growing foci lead to an increased risk of fracture. Pathologic fractures around the hip are influenced by several factors, and the importance of surgical treatment is obvious in this patient population. Considering the primary disease and the overall physical condition, many patients and families forgo surgical treatment when they weigh the cost and value of treating the primary tumor and the hip-related surgery; even doctors may counsel against surgery because they are concerned about whether the unknown postoperative

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survival will be sufficient for patient' recovery of motor function, or whether postoperative complications will shorten the patient's survival. So, should these types of surgeries be performed? How do we measure their needs and values? Perhaps this article will do something to answer these questions.

This study aims to answer these questions by conducting a scoping review of the current clinical research. Despite previous consensus among experts on treating bone metastasis, it was often focused on a specific tumor's bone metastatic diseases, failing to emphasize specific surgeries related to the hip joint. Like other types of reviews, a scoping review comprehensively identifies and analyzes all clinical studies without quality assessments, using strict and transparent methods. Scoping reviews are beneficial when the primary objective is to establish a comprehensive understanding of a disease and its treatment and when there's heterogeneity in the existing literature. For our research questions, compared to other literature review methods, the scoping review is more suitable and hasn't been extensively explored within this patient population. The intended audience for the study's results includes researchers, institutional policymakers, clinicians, and patients.

Abbreviation

SREs: skeletal related events

MDT: multiple disciplinary treatment

PRISMA-P: Preferred Reporting Items for Systematic Review and Meta-Analysis Protocols PRISMA-ScR: PRISMA extension for scoping reviews

OS: overall survival

ADT: androgen deprivation therapy

BMD: bone mineral density

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Not applicable.

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Author contributions

All authors contributed to the study's conception and design. LM and JLL participated in the design of the scoping review, the development of the programme and methodology, and the drafting of the manuscript, LM is the guarantor. ZXY and CHY conducted the initial search and gave feedback on the design, DGF supervised and approved the scoping review protocol. All authors read and approved the final manuscript.

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Competing interests

The authors declare no conflict of interest in the publication of this article.

Availability of data and materials

All data generated or analyzed during this study will be included in the published articles.

Patient consent for publication

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Figure Legend: Fig. 1. Flow diagram of the literature screening process.



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