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Research Article

Assessing The Ability of ChatGPT 5.2 to Answer Patient Questions Regarding Hip Avascular Necrosis

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ABSTRACT

Objective: This study aimed to evaluate the quality and readability of Chat Generative Pretrained Transformer (ChatGPT) 5.2's responses to frequently asked patient questions about hip avascular necrosis (AVN), a challenging condition often requiring clear communication and shared decision-making.

Methods: Sixteen commonly asked patient questions regarding hip AVN were submitted to ChatGPT 5.2 without follow-up queries. Each response was independently evaluated by 2 orthopedic surgeons with over 20 years of experience in hip arthroplasty. The quality of responses was assessed using the grading system proposed by Mika et al. Readability was analyzed using the Flesch–Kincaid Reading Ease Score (FRES) and Flesch–Kincaid Reading Level (FKRL). Interrater reliability (IRR) was calculated using Cohen's kappa test.

Results: Reviewer 1 rated 11/16 responses as "excellent—no clarification required" and 5/16 as "satisfactory—minimal clarification needed." Reviewer 2 rated 10/16 responses as excellent and 6/16 as satisfactory. The mean FRES score was 27.1 (range: 12.4-45.6), indicating the content was "difficult to read." The FKRL scores corresponded to college or college graduate reading levels. The IRR between reviewers was moderate (κ=0.59, 95% CI: 0.09-1.00).

Conclusion: ChatGPT 5.2 provided overall satisfactory to excellent responses regarding hip AVN. However, the high reading level required to understand these answers may limit their effectiveness in patient education unless simplified language is employed.

Level of Evidence: NA.

Introduction

The application of artificial intelligence (AI) is a new and advancing field in medicine used among both physicians and patients. Its use has been increasing exponentially in recent years. Chat Generative Pretrained Transformer (ChatGPT) is an AI chatbot released in November 2022 and is known to accumulate more than 100 million users in a few months.[1] It is a large language model (LLM) trained on enormous information from the Internet and is capable of generating human-like texts, answering questions, and engaging in conversations.[2,3] As ChatGPT has become increasingly popular in the general population, patients have started to seek information regarding their health issues from it in recent years.

As in other fields of medicine, the use of ChatGPT and whether it has a positive or negative impact on patients' knowledge has become a controversial topic in orthopaedics, as well. Although numerous studies have been conducted regarding the responses of ChatGPT to patients' questions, the quality of the answers is still unknown.[4-6]

The objective of this present study is to evaluate the quality and readability of the responses of ChatGPT-5.2 regarding common patient questions about hip avascular necrosis (AVN).

Material and methods

Initially, the Frequently Asked Questions sections of 5 widely used and well-established healthcare websites addressing hip AVN were systematically reviewed, yielding a total of 30 potentially relevant questions. These questions were subsequently evaluated by 2 senior orthopedic surgeons, each with more than 20 years of experience in hip arthroplasty and high-volume clinical practice.

Both surgeons independently reviewed the initial question pool and selected the questions they most frequently encounter during routine outpatient consultations with patients diagnosed with hip AVN. Following this independent assessment, a consensus-based discussion was conducted to identify the questions considered most representative of patients' common concerns in daily clinical practice.

As a result of this consensus process, 16 questions were jointly agreed upon. These questions were selected based on their perceived clinical relevance, frequency of occurrence in real-world patient–physician

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interactions, and their importance in guiding patient understanding and decision-making regarding disease progression and treatment options. This approach was intended to ensure that the final question set accurately reflected the most commonly encountered patient inquiries in routine orthopedic practice. These 16 questions were then posed to ChatGPT-5.2, the premium version of the chatbot, on December 12, 2025. The responses of ChatGPT were recorded independently without follow-up questions.

Quality analysis

The responses were analyzed by the two surgeons in an evidence-based approach. The reviewers were blinded from each other. The surgeons independently rated the responses using the Rating Response System developed by Mika et. al[7] (Table 1). This rating system was used by various authors investigating the responses of ChatGPT regarding patients' questions.[4]

Readibility analysis

The readability of responses was assessed using the Flesch–Kincaid Reading Ease Score (FRES) and Grade Level (FKGL). The FRES is a scoring system grading texts between 0 and 100, in which 0 corresponds to unreadable and 100 corresponds to very easy to read. The FKGL is a modified version of FRES analyzing the years of education required in order to understand the text.

Data analysis

Data analysis was performed using the Statistical Package for the Social Sciences (SPSS version 22.0; IBM Corp.). Interrater reliability (IRR) and its 95% CI were calculated using Cohen's kappa analysis. According to standard interpretation thresholds, kappa values of <0.40 indicate low reliability, 0.41-0.60 moderate reliability, 0.61-0.80 substantial reliability, and >0.80 almost perfect reliability.

Results

Questions and the answers of ChatGPT 5.2 are shown in Table 2. ChatGPT provided responses with a mean of 224 words. The responses started with a summary section followed by bullet points with explanations rather than long paragraphs.

Reviewer 1 rated 11 responses as "excellent response not requiring clarification" and 5 responses as "satisfactory requiring minimal clarification". Reviewer 2 rated 10 questions as "excellent response not requiring clarification" and 6 questions as "satisfactory requiring minimal clarification". There were 3 questions in which the reviewers rated differently from each other.

The mean FRES score was 27.1 (range, 12.4-45.6), corresponding to a text "difficult to read." The Flesch–Kincaid Reading Level scores corresponded to either college level or college-graduate level.

HIGHLIGHTS

- ChatGPT 5.2 was evaluated for its ability to answer 16 frequently asked patient questions about hip avascular necrosis.
- Two experienced hip arthroplasty surgeons rated most responses as excellent or satisfactory in content quality.
- The mean Flesch-Kincaid Reading Ease Score was low (27.1), indicating difficult readability for the average patient.
- Flesch-Kincaid Reading Levels corresponded to college or college graduate level comprehension.
- Despite overall high-quality content, the need for simplified language was evident to improve accessibility and patient understanding.

Table 1. The rating system developed by Mika et. al.

ChatGPT response rating system	
Response accuracy score	**Response accuracy description**
1	Excellent response not requiring clarification
2	Satisfactory requiring minimal clarification
3	Satisfactory requiring moderate clarification
4	Unsatisfactory requiring substantial clarification

In this study, the IRR was calculated with Cohen's Kappa analysis. Cohen's kappa was calculated as 0.59 (95% CI, 0.09-1.00). According to the commonly accepted interpretation of Cohen's kappa values, a kappa coefficient between 0.41 and 0.60 indicates moderate IRR. Therefore, the observed kappa value of 0.59 in this study was classified as reflecting moderate agreement between reviewers.

Discussion

The most important finding from this study was that the responses provided by ChatGPT 5.2 were of acceptable quality in general; however, they required a high reading level to understand the information. It is also essential to emphasize that the chatbot encouraged the patients to discuss their questions with their physicians.

Recent literature includes a growing number of specialty-based studies evaluating ChatGPT-generated responses to common patient questions across various subspecialties of orthopaedics, reflecting the increasing interest in LLMs within musculoskeletal practice.[3,8-13] These studies have examined a wide range of conditions and treatment scenarios; however, despite this expanding body of research, no study has specifically evaluated chatbot responses related to hip AVN. This represents a notable gap, given that hip AVN encompasses diverse etiological factors and a broad spectrum of management options, ranging from conservative measures such as hyperbaric oxygen therapy to surgical interventions including total hip arthroplasty (THA).[14,15] Consequently, patients seeking information online are often confronted with a large volume of heterogeneous and potentially confusing content, underscoring the clinical relevance of evaluating chatbot-based information in this specific disease context.

The Cohen's Kappa analysis showed moderate reliability between the reviewers in the present study. In comparison, a previous study evaluating two authors' ratings of ChatGPT-4.0 responses to patient questions related to hip arthroscopy reported high inter-rater reliability.[4] That study assessed a larger set of questions (25 items), which may have contributed to greater agreement between reviewers. Conversely, another study analyzing chatbot responses to 40 questions covering various orthopedic conditions reported poor inter-reviewer reliability.[16] The authors attributed this finding partly to differences in reviewer background and clinical experience, as the evaluators included one attending physician and one sports medicine fellow. Taken together, these findings suggest that inter-reviewer reliability in studies assessing chatbot responses may be influenced by factors such as the number of evaluated questions, the homogeneity of the topic, and the clinical experience of the reviewers.

In the present study, the authors elected to use the latest premium version of ChatGPT (version 5.2). Previous studies evaluating earlier versions of ChatGPT have reported mixed results, ranging from satisfactory to suboptimal response quality.[1,17-20] Given the rapid and iterative development of LLMs, newer versions are expected to incorporate improved training data, updated knowledge bases,

Table 2. The questions posed to ChatGPT, responses provided, and the rating of the reviewers

Question	Answer	Reviewer 1	Reviewer 2
What are the first signs of avascular necrosis?	The first signs of avascular necrosis (AVN) are often subtle and nonspecific, especially in the early stages. In many patients, the disease may initially be asymptomatic. When symptoms do occur, they typically include: • Intermittent, deep-seated pain in the groin, hip, or buttock, often exacerbated by weight-bearing activities • Activity-related discomfort that improves with rest in early stages • Mild stiffness or a sensation of tightness in the hip joint • Reduced range of motion, particularly in internal rotation and abduction as the disease progresses • Limping (antalgic gait) in more advanced early disease Importantly, plain radiographs are frequently normal in early AVN, and symptoms may precede radiographic changes. Magnetic resonance imaging (MRI) is the most sensitive modality for detecting early-stage disease, often identifying bone marrow edema or subchondral changes before structural collapse occurs. Early recognition of these symptoms is crucial, as timely diagnosis may allow for joint-preserving treatment options prior to femoral head collapse.	1	2
Can AVN spread to other bones?	Yes, avascular necrosis (AVN) can involve more than one bone, but it does not "spread" from one bone to another like an infection or cancer. How AVN affects multiple bones AVN may be multifocal, meaning it can occur simultaneously or sequentially in different bones, especially when there is a systemic risk factor affecting blood supply. Bones commonly involved • Femoral head (most common) • Knees (distal femur, proximal tibia) • Shoulders (humeral head) • Ankles (talus) • Wrists (scaphoid) • Less commonly: jaw, spine Who is at risk for multifocal AVN? Multifocal involvement is more likely in patients with: • Prolonged or high-dose corticosteroid use • Chronic alcohol abuse • Systemic diseases (e.g., sickle cell disease, lupus, hematologic disorders) • Organ transplant recipients • Metabolic or coagulation disorders In such patients, AVN reflects a global impairment of bone blood supply, not local disease progression. Clinical implications • Symptoms may appear at different times and in different joints • Some affected sites may be asymptomatic • MRI screening of other joints may be considered in high-risk patients with confirmed AVN Key takeaway AVN does not spread locally, but it can affect multiple bones due to shared systemic causes. Identifying and controlling underlying risk factors is essential to reduce the likelihood of multifocal disease.	1	1

What is the best treatment for avascular necrosis of the femoral head?	The best treatment for avascular necrosis (AVN) of the femoral head depends primarily on the stage of the disease, the extent of femoral head involvement, and patient-related factors such as age, activity level, and comorbidities. There is no single universal treatment, and management should be individualized.
	Early-stage AVN (pre-collapse)
	When the femoral head contour is preserved:
	• Core decompression is the most commonly recommended treatment
	  • Reduces intraosseous pressure and improves blood flow Most effective in small to medium-sized lesions
	  • Most effective in small to medium-sized lesions
	• Biological augmentation (e.g., bone marrow aspirate concentrate, bone grafting) may be added to improve outcomes
	• Pharmacological treatments (bisphosphonates, anticoagulants) and activity modification may help symptom control but have limited evidence for halting progression
	• MRI-based monitoring is essential to assess disease progression
	Intermediate-stage AVN (early collapse or large lesions)
	• Joint-preserving surgical options may still be considered in selected patients
	  • Vascularized or non-vascularized bone grafting
	  • Osteotomies in carefully selected cases
	• Outcomes are less predictable than in early-stage disease
	Advanced-stage AVN (femoral head collapse and arthritis)
	• Total hip arthroplasty (THA) is the treatment of choice
	  • Provides reliable pain relief and functional improvement
	  • Modern implants show excellent long-term survivorship, even in younger patients
	Key clinical principle
	• Early diagnosis is critical: Joint-preserving treatments are most effective before femoral head collapse.
	• Once structural collapse and secondary osteoarthritis occur, arthroplasty remains the most definitive and effective treatment.
	In summary, core decompression is preferred in early AVN, whereas total hip arthroplasty is the gold standard in advanced disease.
		2	2

(*Continued*)

Table 2. The questions posed to ChatGPT, responses provided, and the rating of the reviewers (*Continued*)

Question	Answer	Reviewer 1	Reviewer 2

Can AVN heal without surgery?	Avascular necrosis (AVN) rarely heals completely without surgery, but the outcome depends strongly on the stage of the disease, lesion size, and risk-factor control.
	When non-surgical management may help
	• Very early AVN (pre-collapse; ARCO/Steinberg stage I)
	  • Some patients experience symptom improvement and radiographic stability
	  • Small lesions, especially medial or central, have a better prognosis
	• Strict risk-factor modification
	  • Discontinuing or minimizing corticosteroids (when medically feasible)
	  • Avoiding alcohol
	  • Treating underlying systemic conditions
	• Protected weight-bearing and activity modification
	• Adjunctive therapies (with variable evidence):
	  • Bisphosphonates, anticoagulants (selected cases)
	  • Physiotherapy for motion and strength (supportive)
	  • Hyperbaric oxygen therapy (early stages, selected patients)
	Important limitations
	• Necrotic bone does not regenerate reliably on its own
	• Non-operative care cannot restore blood supply to dead bone
	• In most patients, AVN progresses over time, particularly in larger or lateral lesions
	When surgery becomes necessary
	• Persistent pain despite conservative care
	• Progression on imaging (MRO or x ray)
	• Femoral head collapse or secondary arthritis
	  • At this point, joint-preserving options are less effective, and total hip arthroplasty is often required
	Bottom line
	AVN can sometimes be stabilized—but rarely cured—without surgery in very early, small lesions with excellent risk-factor control.
	For many patients, however, surgical intervention is ultimately required to prevent collapse or restore function.
		1	1

Is physiotherapy good for AVN of hip?	Physiotherapy can be helpful in avascular necrosis (AVN) of the hip, but its role is supportive rather than curative, and it must be used carefully based on disease stage.
	When physiotherapy is beneficial
	• Early-stage AVN (pre-collapse)
	  • Helps maintain hip range of motion
	  • Improves muscle strength around the hip and core
	  • Reduces stiffness and improves gait mechanics
	• Postoperative rehabilitation
	• After core decompression or other joint-preserving procedures
	• Focuses on controlled mobility while respecting weight-bearing restrictions
	What physiotherapy can and cannot do
	• Can help:
	  • Reduce pain
	  • Improve function and mobility
	  • Prevent secondary muscle weakness and joint stiffness
	• Cannot:
	  • Restore blood supply to necrotic bone
	  • Prevent femoral head collapse on its own
	  • Reverse established structural damage
	Important precautions
	• Avoid high-impact exercises (running, jumping)
	• Limit excessive weight-bearing, especially in symptomatic patients
	• Exercises should be low-impact and supervised, particularly in early disease
	• Over-aggressive therapy may worsen symptoms or accelerate collapse
	Clinical perspective
	Physiotherapy should be considered an adjunct to medical or surgical management, not a stand-alone treatment. The most effective strategy for AVN remains early diagnosis, risk-factor modification, and appropriate stage-based intervention.
	In summary, physiotherapy is useful for symptom control and functional preservation, but it does not treat the underlying cause of hip AVN.
		2	2

What is the main aggravating factor for avascular necrosis?	The main aggravating factor for avascular necrosis (AVN) is continued impairment of blood supply to the bone, which accelerates bone ischemia, structural weakening, and eventual collapse of the femoral head.
	Clinically, the most important and well-established aggravating factors are:
	• Prolonged or high-dose corticosteroid use
	  • Considered the single most common non-traumatic risk factor
	  • Promotes fat embolism, lipid deposition, and increased intraosseous pressure
	  • Directly impairs microcirculation within the femoral head
	• Excessive alcohol consumption
	  • Leads to fatty infiltration of bone marrow
	  • Causes microvascular occlusion and reduced blood flow
	  • Acts synergistically with steroids in accelerating disease progression
	• Continued weight-bearing and mechanical stress after disease onset
	  • Does not cause AVN but significantly aggravates progression
	  • Increases the risk of subchondral fracture and femoral head collapse
	• Ongoing exposure to the underlying cause
	  • Persistent steroid therapy, continued alcohol intake, or untreated systemic disease (e.g., hematologic or metabolic disorders) worsens prognosis
	Key clinical message
	While multiple factors contribute to AVN, uncontrolled steroid use and alcohol abuse are the strongest aggravating factors, and continued mechanical loading markedly accelerates structural failure once ischemia has begun.
	Early identification and elimination of these aggravating factors are essential to slow disease progression and preserve the native hip joint.
		2	1

(*Continued*)

Table 2. The questions posed to ChatGPT, responses provided, and the rating of the reviewers (*Continued*)

Question	Answer	Reviewer 1	Reviewer 2

Why is the femoral head prone to avascular necrosis?	The femoral head is particularly prone to avascular necrosis (AVN) because of its unique and vulnerable blood supply, combined with high mechanical loading across the hip joint.
	• Limited and terminal blood supply
	  • The femoral head is supplied primarily by the retinacular branches of the medial femoral circumflex artery
	  • These vessels are end arteries with minimal collateral circulation
	  • Any disruption—trauma, increased intraosseous pressure, or vascular occlusion—can easily compromise perfusion
	• Intracapsular anatomy
	  • The key blood vessels run within the hip joint capsule along the femoral neck
	  • Intracapsular fractures, joint effusion, synovitis, or increased capsular pressure can impair blood flow
	• High mechanical stress
	  • The femoral head bears significant load during daily activities
	  • Ischemic bone is mechanically weaker, making it susceptible to subchondral fracture and collapse
	• Limited capacity for repair
	  • Once blood supply is compromised, revascularization is slow and incomplete
	  • Necrotic bone cannot remodel effectively under continued load
	• Sensitivity to systemic risk factors
	  • Corticosteroids, alcohol, and systemic diseases preferentially affect the microcirculation of the femoral head
	
	Key takeaway
	The combination of a terminal blood supply, intracapsular vulnerability, and high mechanical demand makes the femoral head uniquely susceptible to avascular necrosis compared with other skeletal sites.
		2	2

What is the role of core decompression in the treatment of avascular necrosis (AVN)?	Core decompression plays a central role as a joint-preserving surgical option in the treatment of avascular necrosis (AVN) of the femoral head, particularly in the early, pre-collapse stages of the disease. Mechanism of action Core decompression involves drilling one or more channels into the necrotic area of the femoral head to: • Reduce intraosseous pressure • Improve local blood flow • Stimulate revascularization and bone healing • Decrease pain by relieving marrow edema Indications • Early-stage AVN (ARCO/Steinberg stages I–II) • No femoral head collapse • Small to medium-sized lesions • Symptomatic patients who have failed conservative treatment Clinical benefits • Provides pain relief • May delay or prevent femoral head collapse • Can postpone or avoid total hip arthroplasty, especially in younger patients • Outcomes are improved when combined with biological augmentation (e.g., bone marrow aspirate concentrate or bone grafting) Limitations • Effectiveness decreases significantly in advanced stages • Does not restore already necrotic bone • Some patients may still progress and require hip replacement Role in treatment strategy Core decompression is best viewed as an early intervention aimed at joint preservation, rather than a definitive cure. When performed in appropriately selected patients and combined with risk-factor modification and protected weight-bearing, it remains one of the most widely accepted surgical options for early AVN.	1	1

Can you reverse avascular necrosis?	Avascular necrosis (AVN) generally cannot be fully reversed, but its progression can sometimes be slowed or stabilized, especially when detected early.
	Why AVN cannot usually be reversed
	
	• AVN is caused by loss of blood supply, leading to death of bone tissue
	• Necrotic bone does not regenerate reliably once structural damage has occurred
	• Restoring normal bone architecture after necrosis is biologically limited
	
	When improvement is possible
	
	• Very early-stage AVN (pre-collapse; ARCO I)
	  • Some patients show symptom improvement and radiographic stability
	  • Small lesions may partially revascularize
	• Early intervention, including:
	  • Risk-factor modification (stopping steroids, avoiding alcohol)
	  • Protected weight-bearing
	  • Core decompression ± biological augmentation
	  • Adjuncts such as hyperbaric oxygen therapy (selected cases)
	
	What treatments can and cannot do
	
	• Can do:
	  • Improve blood flow
	  • Reduce pain
	  • Delay or prevent femoral head collapse
	• Cannot do:
	  • Fully regenerate dead bone
	  • Reverse collapse or secondary arthritis
	
	Advanced disease
	
	• Once femoral head collapse or arthritis occurs, reversal is not possible
	• Total hip arthroplasty becomes the most effective treatment
	
	Bottom line
	AVN is rarely reversible, but early diagnosis and timely treatment can preserve the joint and significantly improve outcomes. The goal of treatment is stabilization and joint preservation, not true reversal.
		1	1

(*Continued*)

Table 2. The questions posed to ChatGPT, responses provided, and the rating of the reviewers (*Continued*)

Question	Answer	Reviewer 1	Reviewer 2
Is arthritis the same as avascular necrosis?	No, arthritis and avascular necrosis (AVN) are not the same, although they can be related and may coexist. Key differences Avascular necrosis (AVN) • Caused by loss of blood supply to the bone • Leads to death of bone tissue, most commonly in the femoral head • Often affects younger or middle-aged adults • Early stages may have normal X-rays; MRI is most sensitive • If untreated, can lead to collapse of the bone and secondary arthritis Arthritis (most commonly osteoarthritis) • A degenerative joint disease involving cartilage wear and joint degeneration • Develops gradually due to aging, mechanical stress, or prior joint damage • Typically affects older individuals • Characterized by joint space narrowing, osteophytes, and stiffness on X-rays • How they are related • AVN can progress to arthritis • Once the femoral head collapses due to AVN, secondary osteoarthritis commonly develops • At that stage, symptoms and treatment options may resemble those of arthritis • Clinical takeaway • AVN is a bone disease caused by ischemia • Arthritis is a joint disease involving cartilage degeneration • They are distinct conditions, but AVN is an important cause of secondary arthritis, particularly in the hip • Accurate diagnosis and staging are crucial because early AVN may be treated with joint-preserving procedures, whereas advanced arthritis often requires joint replacement surgery.	1	1
What are the symptoms of avascular necrosis?	The symptoms of avascular necrosis (AVN) vary depending on the stage of the disease and the affected joint, most commonly the hip. Early stages may be subtle or even asymptomatic, while symptoms become more pronounced as the disease progresses. Early-stage symptoms • Mild, intermittent pain in the groin, hip, buttock, or thigh • Pain typically occurs with weight-bearing or activity and improves with rest • Stiffness or a feeling of tightness in the joint • Often normal physical examination and plain radiographs • Progressive-stage symptoms • Persistent and worsening pain, including pain at rest • Reduced range of motion, especially hip internal rotation and abduction • Limping (antalgic gait) due to pain • Functional limitation in daily activities such as walking, standing, or climbing stairs • Advanced-stage symptoms • Severe, constant pain • Marked joint stiffness and deformity • Development of secondary osteoarthritis • Significant impairment in mobility and quality of life Important clinical note Symptoms may precede radiographic changes, and early disease can only be reliably detected with magnetic resonance imaging (MRI). Early recognition of symptoms is crucial, as joint-preserving treatments are most effective before femoral head collapse. In summary, AVN typically begins with activity-related pain and stiffness and progresses to constant pain and functional disability if left untreated.	2	2

What is the success rate of core decompression for AVN?	The success rate of core decompression for avascular necrosis (AVN) of the femoral head varies widely and depends on several key factors, particularly the stage of disease, lesion size and location, and whether biological augmentation is used.
	Overall success rates
	• Reported success rates range from 50% to 80% in early-stage AVN
	• "Success" is commonly defined as:
	  • Pain relief
	  • Radiographic stability
	  • Avoidance or delay of femoral head collapse and total hip arthroplasty (THA)
	Stage-dependent outcomes
	• Pre-collapse stages (ARCO I-II):
	  • Success rates of approximately 65%-80%
	  • Best results seen in small to medium-sized lesions
	• Early collapse or large lesions:
	  • Success rates drop to <40%-50%
	• Post-collapse stages:
	  • Core decompression is generally ineffective
	Effect of biological augmentation
	• Core decompression combined with:
	  • Bone marrow aspirate concentrate (BMAC)
	  • Bone grafting has shown higher success rates compared with decompression alone in several studies.
	Factors associated with better outcomes
	• Early diagnosis
	• Smaller necrotic area
	• Medial or central lesion location
	• Strict adherence to postoperative weight-bearing restrictions
	• Elimination of risk factors (e.g., steroid use, alcohol)
	Key clinical message
	Core decompression is most effective when performed early, before femoral head collapse. While it can delay or prevent the need for total hip arthroplasty in selected patients, outcomes are variable, and some patients will still progress despite treatment.
	Patients should be counseled that core decompression is a joint-preserving strategy with realistic but not guaranteed success.
		1	2

(*Continued*)

Table 2. The questions posed to ChatGPT, responses provided, and the rating of the reviewers (*Continued*)

Question	Answer	Reviewer 1	Reviewer 2

What precautions should you take after core decompression surgery?	After core decompression surgery for avascular necrosis of the femoral head, appropriate postoperative precautions are essential to protect the femoral head, promote revascularization, and reduce the risk of collapse. These precautions are typically individualized, but general principles include:
	• Weight-bearing restrictions
	  • Partial or protected weight-bearing with crutches or a walker is usually recommended
	  • Duration commonly ranges from 4 to 8 weeks, depending on lesion size, surgical technique, and surgeon preference
	  • Premature full weight-bearing can increase the risk of subchondral fracture or collapse
	• Activity modification
	  • Avoid high-impact activities (running, jumping, heavy lifting)
	  • Gradual return to daily activities is encouraged under guidance
	  • Low-impact exercises (e.g., stationary cycling) may be allowed once pain permits
	• Physical therapy
	  • Early focus on gentle range-of-motion exercises to prevent stiffness
	  • Progressive strengthening of hip and core muscles
	  • Therapy should respect weight-bearing limitations
	• Pain and medication management
	  • Use prescribed analgesics as directed
	  • In selected cases, medications such as bisphosphonates or anticoagulants may be continued based on underlying risk factors
	• Risk factor control
	  • Discontinue or minimize corticosteroid use if medically feasible
	  • Avoid alcohol consumption, as it negatively affects bone healing
	  • Optimize management of underlying systemic conditions
	• Wound care and infection prevention
	  • Keep the surgical site clean and dry
	  • Monitor for signs of infection (redness, swelling, fever, drainage)
	• Follow-up and imaging
	  • Regular clinical follow-up is essential
	• MRI or radiographs may be used to monitor healing and detect early progression
	
	Key takeaway
	The most critical precaution after core decompression is strict adherence to weight-bearing restrictions combined with elimination of aggravating risk factors. These measures significantly influence surgical success and long-term joint preservation. Patients should always follow the specific postoperative protocol provided by their treating surgeon, as recommendations may vary based on individual clinical factors.
		1	1

What are the disadvantages of core decompression?	Core decompression is a commonly used joint-preserving procedure for early avascular necrosis (AVN) of the femoral head, but it has several important disadvantages and limitations that should be clearly understood:
	• Limited effectiveness in advanced disease
	  • Outcomes are highly stage-dependent
	  • Significantly less effective once femoral head collapse or large necrotic lesions are present
	  • Not recommended for advanced-stage AVN
	• Variable and unpredictable success rates
	  • Pain relief and disease progression are not guaranteed
	  • Some patients continue to deteriorate despite technically successful surgery
	  • Failure rates increase with larger lesion size and lateral head involvement
	• Does not reverse existing bone damage
	  • Core decompression improves blood flow but cannot restore already necrotic bone
	  • Structural integrity of the femoral head may remain compromised
	• Risk of femoral head collapse
	  • Especially if postoperative weight-bearing restrictions are not followed
	  • Subchondral fracture may still occur even after surgery
	• Need for further surgery
	  • A substantial proportion of patients eventually require total hip arthroplasty (THA)
	  • Core decompression may delay but not always prevent joint replacement
	• Surgical risks
	  • Although minimally invasive, complications can occur, including:
	  • Infection
	  • Fracture along the decompression tract
	  • Persistent postoperative pain
	
	Key clinical perspective
	Core decompression is most effective in carefully selected patients with early-stage AVN, small to medium lesions, and good compliance with postoperative protocols. Its main disadvantages lie in its limited durability, stage dependency, and the possibility of progression despite treatment.
	Patients should be counseled that core decompression is a joint-preserving attempt, not a definitive cure, and realistic expectations are essential.
		1	1

(*Continued*)

Table 2. The questions posed to ChatGPT, responses provided, and the rating of the reviewers (*Continued*)

Question	Answer	Reviewer 1	Reviewer 2

Who is not a candidate for hyperbaric oxygen therapy?	Hyperbaric oxygen therapy (HBOT) can be beneficial in selected conditions, but not all patients are suitable candidates. Some contraindications are absolute, while others are relative and require careful risk–benefit assessment.
	Absolute contraindication
	• Untreated pneumothorax
	  • This is the only absolute contraindication
	  • Pressure changes during HBOT can cause life-threatening lung collapse
	Common relative contraindications
	Patients with the following conditions may not be suitable or require special precautions:
	• Severe chronic obstructive pulmonary disease (COPD) with air trapping
	• Bullous lung disease or history of spontaneous pneumothorax
	• Uncontrolled seizure disorders
	• Recent ear or sinus surgery, severe sinusitis, or inability to equalize middle ear pressure
	• Claustrophobia that cannot be managed conservatively
	• Active upper respiratory infections
	Medication-related contraindications
	• Use of certain drugs that increase oxygen toxicity risk, such as:
	  • Doxorubicin
	  • Bleomycin
	  • Cisplatin (relative)
	• Disulfiram
	Other considerations
	• Uncontrolled high fever
	• Severe cardiac instability
	• Pregnancy (relative; depends on indication)
	• Poor patient cooperation or inability to comply with treatment protocols
	Clinical takeaway
	HBOT is not appropriate for patients with untreated pneumothorax and should be used with caution—or avoided—in those with significant pulmonary disease, seizure risk, or contraindicated medications. Careful pre-treatment screening and multidisciplinary evaluation are essential to ensure patient safety.
	Patients should always be assessed by a hyperbaric medicine specialist before initiation of therapy.
		1	1

Can a hyperbaric chamber help with avascular necrosis?	• Yes, a hyperbaric oxygen chamber (HBOT) can help in avascular necrosis (AVN)—but only in selected cases, and it is not a definitive or stand-alone treatment.
	• How HBOT may help in AVN
	• Hyperbaric oxygen therapy increases the amount of dissolved oxygen in blood and tissues, which may:
	• Improve oxygen delivery to ischemic bone
	• Promote angiogenesis (new blood vessel formation)
	• Reduce bone marrow edema
	• Support bone healing and revascularization
	When HBOT is most useful
	• Early-stage AVN (pre-collapse)
	  • Steinberg/ARCO stage I–II
	  • Femoral head shape preserved
	• Patients with small lesions and early symptoms
	• Often used as an adjunct to:
	  • Conservative treatment
	  • Core decompression
	Limitations of HBOT
	• Limited evidence: Studies show symptom improvement and delayed progression, but data are heterogeneous
	• Not effective after femoral head collapse
	• Does not reverse necrotic bone
	• Requires multiple sessions (often 20–40+), which can be costly and time-consuming
	• Not universally available
	• Current clinical perspective
	• HBOT may reduce pain and slow progression in early AVN
	• It cannot replace surgical treatment when structural damage is present
	• In advanced disease, total hip arthroplasty remains the gold standard
	Bottom line
	Hyperbaric oxygen therapy can be a useful adjunctive option in early avascular necrosis, particularly before femoral head collapse, but it should be viewed as supportive therapy, not a cure. Careful patient selection and staging with MRI are essential.
		1	1

and enhanced response coherence. Therefore, the use of the most recent version was intended to provide a more accurate and up-to-date assessment of chatbot performance, while also reflecting the information that patients are most likely to encounter in current real-world use.

A high reading level was required to comprehend the information provided by ChatGPT, which is consistent with findings from previous studies evaluating the readability of ChatGPT-generated responses.[5,21] This result may be explained by the fact that LLMs are predominantly trained on academic and professional medical literature, which commonly includes complex terminology and syntactic structures. Consequently, while the informational quality of the responses was acceptable, their accessibility for the general patient population may be limited. Explicitly simplifying user prompts and requesting plain-language outputs could mitigate this issue and enhance patient comprehension. Notably, the chatbot consistently encouraged users to consult their physicians regarding their concerns, which supports appropriate clinical decision-making and aligns with responsible patient education.

The study was not without limitations. Most importantly, our results were subjective regarding the quality of the answers. The rating system depended on the decisions of the two reviewers. However, it is believed that the high level of experience of the reviewers limited the subjectivity of the results. Second, only 16 questions were evaluated. It is considered that including more questions would affect the IRR. Nevertheless, it was found that the questions identified on healthcare websites overlapped after 16 questions, and including them in the current study would not significantly change the results.

This study showed that ChatGPT 5.2 provided at least satisfactory responses regarding patient questions about hip AVN; however, a high reading level was required to comprehend the information provided.

Data Availability Statement: The data that support the findings of this study are available on request from the corresponding author.

Q1 **Artificial Intelligence Usage Statement:** The authors declared that no Artificial Intelligence Tool was used in the preparation of the manuscript.

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Q1 If generative AI and/or LLM tools were used, the following statement should be included: “This study used [name of the tool/service] to [state the purpose, e.g., improve language, edit grammar, generate content, etc.] during the preparation of the manuscript.