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Angioembolization in the management of joint pain: current concepts

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Abstract

Joint pain is a common complaint owing to its origin in inflammatory and degenerative joint diseases. Recent research has helped narrow down inadequate angiogenesis as one of the causes. Angioembolization has emerged as a treatment option for this condition when it is refractory to conservative treatment. This review describes angioembolization by elaborating on the mechanism, safety, efficacy, comparative analysis of treatment and the road ahead, in addition to summarizing the existing data on this treatment. The inferences from this review further consolidate transcatheter arterial embolization as one of the prime options for managing joint pain when it is refractory to conservative treatment and label it as one of the most exciting prospects. A limitation of this review is that most of the data were from open label case series or case reports.

Keywords
Mechanism · Clinical studies · Comparative analysis · Safety · Efficacy

Introduction

One of the most common complaints in rheumatology is joint pain [1], which is an intricate problem intertwined with inflammatory and degenerative joint diseases [2]. The conditions under its purview include osteoarthritis, rheumatoid arthritis and fibromyalgia [3]. On the younger side of the patient spectrum, rheumatoid arthritis is more common, while people on the other side of the spectrum are plagued with osteoarthritis [4]. In all these conditions, pain is the primary reason people enlist the help of medical professionals [5, 6]. Joint pain not only affects the quality of life of the patient [7] but has a significant impact on the immediate family [8]. Osteoarthritis directly correlates with age, with only 13.9% of adults aged 25 years and above affected, in contrast to 33.6% of adults aged 65 years and over [9]. The increase in the average age and obesity in the population are key factors contributing to joint pain [8]. The treatment for joint pain in osteoarthritis (OA) involves a combination of treatment of both the pharmacological and non-pharmacological domains. The pharmacological options vary with severity, with topical nonsteroidal anti-inflammatory drugs (NSAIDs) and capsaicin used for mild OA, oral NSAIDs for moderate to severe OA, and duloxetine for multiple joint OA with

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a high risk of NSAID-related complications [10, 11]. Treatment via a non-pharmacological route involves physical therapy and surgery [12]; however, there is a lack of clarity on the use and the associated adverse effects [13].

Transcatheter arterial embolization (TAE) is a suitable alternative. It was initially designed as a minimally invasive procedure carried out by interventional radiologists and is used for two main objectives: reducing the size of hypervascular tumors and controlling bleeding. This technique focuses on the embolization of small arteries to achieve the objectives [14]. The elevated presence of blood vessels and associated nerves has long been hypothesized to contribute to chronic pain. This treatment aims to mitigate pain by occluding the aberrant vessels. As a result, this tissue ceases to function as a producer of pro-inflammatory mediators or nociceptive triggers, leading to the resolution of pain [15]. The TAE method represents an innovative intervention poised to revolutionize clinical care and radically change the approach to managing joint pain. This narrative review was conducted to further knowledge of various aspects of angioembolization in managing joint pain.

Mechanism of angioembolization

The TAE is a minimally invasive technique that entails occluding target vessels through the infusion by infusing an embolic agent [16–18]. The resulting blockade in vascular supply causes the pathological tissue to involute. The consequence is that the tissue ceases to serve as a stimulus for pain or generate pro-inflammatory agents, contributing to the resolution of pain [15]. Synovitis is commonly observed in the development of OA, denoted by pathogenic inflammation within the synovium featuring angiogenesis [19]; however, the biological mechanisms involved in tendinopathy are yet to be elucidated.

Nonetheless, macrophages, chronic inflammation, and angiogenesis have been postulated to significantly contribute to the perpetuation of inflammation [20]. Adhesive capsulitis paints a similar picture with existing evidence suggesting the potential involvement of synovitis, fibroblastic proliferation, angiogenesis, chronic inflammation, and the development of fibrotic contracture within the rotator interval [21]. The synchronous upregulation of neurogenesis and angiogenesis may cause the establishment and persistence of chronic pain [22–24]. Angiogenesis is associated with various mediators, such as chemokines and their receptors (chemokine [C-X-C motif] ligand 1, CXCL1), matrix molecules like fibronectin, cell adhesion molecules such as E-selectin, growth factors like vascular endothelial growth factor (VEGF), cytokines including tumor necrosis factor (TNF)-alpha, and proteases like matrix metalloproteinases (MMPs) [25, 26]. As angiogenesis is a component in the pathogenesis of OA and tendinopathy, these conditions are particularly receptive to targeting hypervascular tissue using TAE [27, 28]. Applications for TAE extend beyond the domain of joint pain [29–31]. Kuttapitiya et al., while investigating the synchronous expression of osteogenic and angiogenic genes, observed tissue changes that further strengthened this correlation. These observations suggest a potential interaction between vascular proliferation and bone formation, establishing a link with the formation of bone marrow lesions [22]. There is a lack of studies examining the impact of genicular artery embolization (GAE) on bone marrow lesions (BML).

Nevertheless, a recently published retrospective study highlighted the efficacy in treating knee OA regardless of BMLs. In the absence of osteonecrosis, the study's findings suggest that GAE substantially reduced the size of BMLs in OA patients [32]. The mechanism of action of TAE is summarized in ◘ **Fig. 1**.

Abbreviations

ASES	American Shoulder and Elbow Surgeons
BMLs	Genicular Artery Embolisation (GAE) on bone marrow lesions
CXCL1	Chemokine (C-X-C motif) ligand 1
DASH	Disability of the Arm, Shoulder and Hand
MMPs	Matrix metalloproteinases
NSAIDs	Non-Steroidal Anti-Inflammatory Drugs
OA	Osteoarthritis
TAE	Transcatheter arterial embolisation
TM	Trapeziometacarpal
TNF-α	Tumor necrosis factor
VAS	Visual analogue scale
VEGF	Vascular endothelial growth factor
WOMAC	Western Ontario and McMaster Universities Osteoarthritis Index

Clinical studies

Knee

As it was initially used for knee hemarthrosis, GAE is currently adapted for symptomatic knee osteoarthritis [33]. Padia et al. evaluated GAE in the absence of a control group, and 34 of 40 patients experienced a reduction of over 75% in Western Ontario and McMaster Universities Osteoarthritis Index (WOMAC) scores after 12 months. A pitfall of this study is the absence of a placebo group, although the extended duration of the follow-up could partly subdue this pitfall [34]. Bagla et al. [35] evaluated 14 patients undergoing GAE, while 7 received a sham procedure. At the 1-month follow-up all patients in the sham group had transitioned to GAE. Over 1 month GAE demonstrated a substantial reduction in knee pain severity, dropping by 51 points on a 0–100 visual analogue scale, in contrast to a mere 1-point reduction with sham treatment ($p < 0.01$).

Similarly, the WOMAC total scores decreased by 30 points with GAE and 5 points with sham treatment ($p = 0.02$). This implies a minimal placebo effect associated with GAE, differentiating it from other knee osteoarthritis therapies [36]. In an observational study, clinical improvement was observed in 80% of the participants during a 3-month follow-up period, while the technical aspect of the procedure was flawless, confirming the safety and effectiveness of this innovative GAE technique in individuals with mild to moderate OA unresponsive to conservative treatment. The shortcomings of this research include the small size of the participant group and the comparatively brief duration of follow-up [37]. Shibuya et al. showed GAE in a positive light, with both patients reporting significant pain relief and no regression of symptoms at 2 years [38]. A case series conducted by Kim et al. involving 3 patients reported a 42% reduction in WOMAC immediately after the procedure

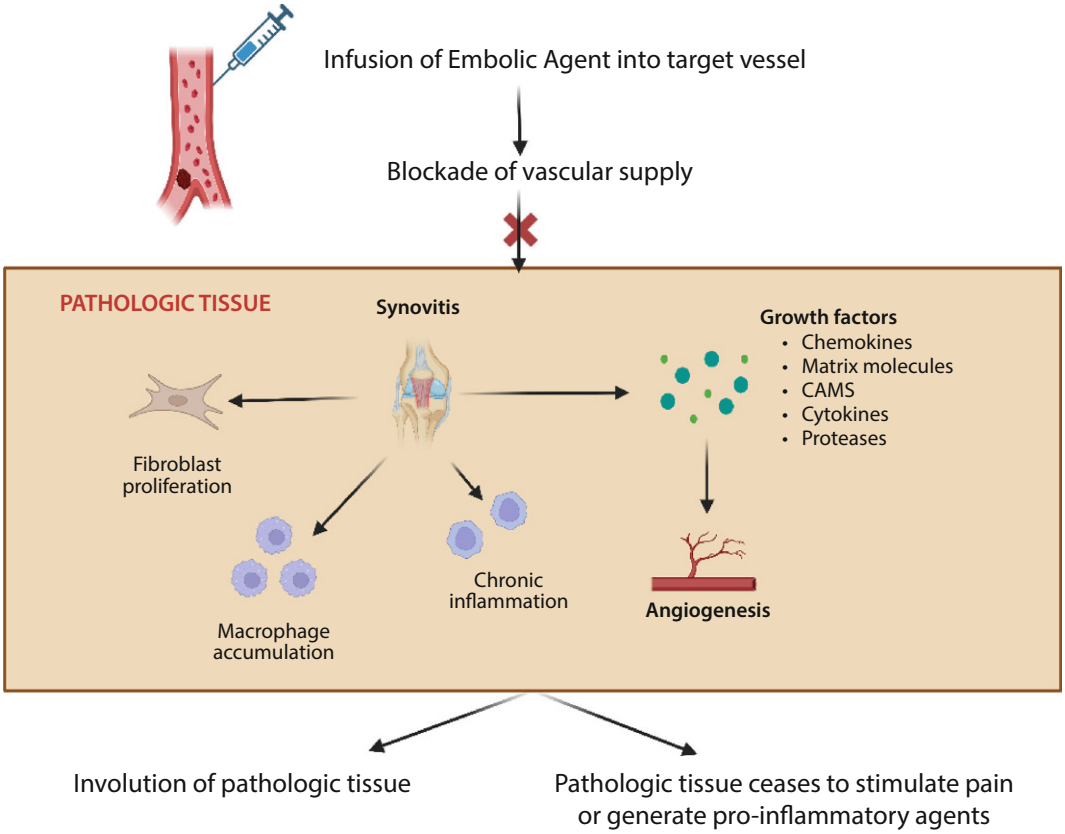


Fig. 1 ◀ Mechanisms of pathologic tissue response and intervention via embolic agents

and a 30% reduction at the 2-month interval [39]. Another case report by Lauko et al. involving a 60-year-old female was a resounding success with an 88% decrease in WOMAC score at 1-month and 3-month intervals [40]. Transarterial embolization has also improved the synovitis associated with an osteoarthritic knee joint [41]. Another interesting point is that a direct proportional relationship exists between pain reduction via GAE and KL grade [42]. All the data above were regarding knee osteoarthritis, but transarterial embolization has also produced promising results when used for patellar tendinitis [43, 44].

Shoulder

In a case study detailing the embolization of multiple arteries, successful treatment of four symptomatic arteriovenous malformations in the left upper extremity was achieved via a comprehensive procedure. This approach encompasses a combination of transarterial, transvenous, and direct cannulation techniques, effectively managing the condition. A 44-year-old male patient experienced significant improvement, reporting almost complete alleviation of symptoms during the 24-h, 2-week, and 6-month follow-up assessments [45]. In a study conducted in Japan, the effectiveness of TAE in treating adhesive capsulitis was investigated in 25 patients, with the condition defined by specific criteria, such as nighttime shoulder pain, limited shoulder movement, and standard X-rays. All patients had persistent moderate to severe pain despite 3 months of conservative therapy and met the specific exclusion criteria. The technical success rate was 100%, without any major complications. Minor issues, such as temporary periprocedural pain and transient vasospasm, occurred in the minority of patients. Drastic improvements were observed in nighttime pain scores, overall, visual analogue scale (VAS) pain scores (82 [11] vs. 5 [11]), and range of motion in 24 of 25 subjects (96%) at the 6-month mark ($P < 0.001$ for all). Moreover, functional improvements were reflected in the mean American Shoulder and Elbow Surgeons (ASES) scores at 6 months (16.1 [3.6] vs. 96.6 [4.3], $P < 0.001$) [46].

A cohort study involving 13 patients with shoulder or elbow tendinopathy encompassing conditions such as lateral epicondylitis, calcific tendinitis, and rotator cuff tendinopathy, showed a significant reduction in VAS pain scores at 1 week and 4 months post-TAE. Nonetheless, conclusions on the efficacy of TAE with emphasis on shoulder tendinopathy cannot be drawn, as the analysis was conducted without focusing on any specific etiology [21]. In a study of 15 patients with adhesive capsulitis and tendon bursitis, only 20% achieved clinical success in TAE for shoulder pain. Once again, etiology was disregarded when performing the analysis [47].

Elbow

In a single center study conducted in Japan for treating lateral epicondylitis, with specific emphasis on the safety and efficacy of TAE, the intention to treat clinical success rate was found to be 88% after a 6-month interval [48]. Another case series in Japan discussed seven patients who underwent TAE for refractory tendinopathy/enthesopathy at various sites, including the elbow, shoulder, knee, and ankle.

Table 1 Summary of clinical findings by the joint involved

Joint involved	Condition	Author	Sample size (*N*)	Clinical findings
Knee	Knee osteoarthritis	Padia et al. [34]	40	75% reduction in WOMAC scores at 12 months. Study lacks a control group
		Bagla et al. [35]	14	30-point reduction in WOMAC score for GAE , versus 5 for the sham procedure. Minimal placebo effect
		Gorsi et al. [37]	10	50% reduction in VAS score and 66% reduction in WOMAC score after 3 months. Small sample size and short follow-up *period*
		Shibuya et al. [38]	3	42% reduction in WOMAC immediately postprocedure, 30% at 2 months
		Kim et al. [39]	$N=2$	Immediate and 1-month reductions in WOMAC (42% and 30%) and NRS (26% and 30%)
		Lauko et al. [40]	1	88% decrease in WOMAC at 1 and 3 months
	Patellar tendinitis	Katoh et al. [43]	3	Significant pain relief on day 1. No follow-up reported
		Okuno et al. [44]	7	76 and 86% decreases in VAS at 1-day and 4-month intervals
Shoulder	AV malformation	Cusimano et al. [45]	1	Near complete symptom alleviation at day 1, 2 weeks, and 6 months
	Adhesive capsulitis	Okuno et al. [46]	25	Drastic improvements in VAS and ASES scores at 6 months in 24 patients
	Shoulder tendinopathy	Hwang et al. [21]	13	Significant VAS score reduction at 1 week and 4 months. Study did not focus on specific etiology
	Chronic refractory shoulder pain	Gremen et al. [47]	15	20% clinical success rate
Elbow	Lateral epicondylitis	Iwamoto et al. [48]	24	55% and 90% reductions in Quick DASH at 1 and 6 months, respectively. 36% needed a second procedure. VAS reductions of 36% at 1 month, 80% at 6 months
	Elbow tendinopathy	Okuno et al. [44]	7	86% improvement in VAS at 4 months
	Medial epicondylitis	Lee et al. [49]	14	85.7% clinical success rate. Significant reductions in VAS and QuickDASH at 6 months
Hip	Hip synovitis	Correa et al. [50]	1	Pain relief at 4 months post-procedure. High risk of necrosis
Finger, trapeziometacarpal	Trapeziometacarpal osteoarthritis	Inui et al. [52]	31	84% reported substantial improvement on PGIC at 2 months. 58% underwent a second procedure
Ankle	Achilles tendinopathy	Okuno et al. [44]	7	Reduction in VAS score noted for all patients, including those with Achilles tendinopathy

Initially, these patients experienced persistent pain despite conservative therapy for at least 3 months, with pain scores above 50 on a 100 VAS scale. After 4 months, all 7 patients showed marked improvement in mean VAS pain scores (100% success rate), with a significant decrease from baseline (mean [SD] at baseline vs. 4 months: 72.7 [9.9] vs. 9.7 [6.8]; $P<0.001$) [44]. Amidst a cohort of 14 patients with refractory epicondylitis, the clinical success rate was 85.7%. The mean VAS pain and Quick version of the Disability of the Arm, Shoulder and Hand (DASH) scores significantly decreased from day 1 to 6 months postprocedure. Notably, 9 of 14 patients exhibited sustained improvement for up to 12 months following TAE [49]. Additional research involving homogeneous cohorts is essential to ascertain effectiveness of TAE in treating distinct shoulder tendinopathies.

Hip

A single case study exploring the use of TAE in managing hip synovitis focused on a patient with a decade-long history of hip pain caused by hip synovitis. The TAE technique used in this study involved microbead embolization targeting the ascending branch of the lateral femoral circumflex artery. At the 4-month interval, the patient experienced pain relief and improved walking ability. Nevertheless, emphasis was laid on the technical difficulties of identifying and accessing the target vessel, warning against using microbeads in hip procedures as necrosis is a looming complication [50].

Finger and trapeziometacarpal OA

OA occurring at the base of the thumb is labelled as trapeziometacarpal OA (TM-OA) or carpometacarpal osteoarthritis and affects approximately 15% of adults aged 30 years and above [51]. To examine the viability of TAE as a potential treatment for TM-OA, a study involving 31 patients with TM-OA unresponsive to conservative therapies received radial artery infusion of imipenem/cilastatin. The procedure was technically flawless, and the study observed significant enhancements in pain and disability assessments persisting up to 24 months posttreatment with no occurrence of major adverse events. As with other joints, angiogenesis and inflammation are believed to contribute to disease progression [52]. OA in the fingers is frequently observed in the distal inter-

Table 2 Findings related to types of embolic agent

Type of embolic agent	Author	Significant findings
Permanent embolic agent	Little et al. [55]	Demonstrated increased efficacy in limiting non-target embolization of permanent particles
	Bagla et al. [56] ($N = 20$)	Skin discoloration without ulcer healed at 3-month interval ($N = 13$); Small access site hematoma ($N = 1$)
Temporary embolic agent	Okuno et al. [57] ($N = 72$)	Moderate subcutaneous haemorrhage in 12 patients resolved in 1 week; 4 out of 7 patients treated with Embozene showed cutaneous color change
	Inui et al. [52] ($N = 31$)	Moderate subcutaneous hematoma observed in one patient at puncture site
Comparison between permanent and temporary embolic agents	Torkian et al. [60]	No difference in clinical efficacy between permanent and temporary embolic agents

phalangeal joint, with women aged over 50 years being the most affected [53].

Ankle

The characteristic feature of insertional Achilles tendinopathy is the painful thickening of the Achilles tendon at its insertion into the posterior calcaneus [54]. During exploratory research involving a diverse group, one patient had Achilles tendinopathy. TAE was technically flawless but resulted in a significant reduction in VAS scores for all patients [44]. During exploratory research involving a diverse group of patients with Achilles tendinopathy, TAE was performed without any technical issues. Yet, it led to a substantial decrease in VAS scores for every patient. The case studies are summarized in **Table 1**.

Safety and efficacy

Little et al. [55] demonstrated increased efficacy in limiting non-target embolization of permanent particles to cutaneous branches (11%) by inducing temporary vasoconstriction using a pre-embolization ice pack on the skin surface compared to prior studies by Bagla et al. [56] and Okuno et al. [57] (65% and 57%, respectively). In a survey by Padia et al. examining the impact of GAE, one of the adverse events was a minor groin hematoma at the femoral arterial access site, necessitating unscheduled overnight hospital observation; however, the subsequent follow-up ultrasound showed a normal femoral artery without any issues [34].

One of the most frequent complications of TAE is transient cutaneous erythema, affecting 12% of patients (21 out of 181), with the duration and incidence considerably increasing with permanent embolic (63%, lasting 1–3 months) in comparison to temporary embolic like IPM-CS (2.5%, lasting 3 weeks) [55–59]. Cutaneous ischemic complications were higher with microspheres smaller than 300 µm, attributed to their travel to the distal cutaneous branches [33]. These findings underscore the potential impact of embolic choice on complication rates, highlighting the importance of further research to optimize TAE techniques for improved patient outcomes.

Evaluation of the effectiveness of primary embolic agents, such as imipenem/cilastatin and Embozene, in decreasing the total WOMAC scores across the studies failed to exhibit a statistically significant difference in clinical efficacy resulting from the diminution of the total WOMAC score between these medications ($P = 0.56$). Nonetheless, Embozene microspheres (Boston Scientific Corp, Watertown, MA, USA) demonstrated slightly lower efficacy concerning functional improvement, when followed up after a 1-month duration ($P = 0.6$) [60]. Regarding the influence of GAE on medication usage reduction, the findings pointed to a significant decline in the use of opioids, NSAIDs, and intra-articular hyaluronic acid by approximately 27%, 65%, and 73%, respectively ($P < 0.00001$ for all); however, no such change was observed in acetaminophen consumption [60]. The safety and efficacy of TAE are elaborated in **Table 2**.

Comparative analysis

The NSAIDs have been the primary pharmacological approach for managing joint pain [61, 62], and providing effective pain relief; however, their efficacy is coupled with significant risks. The use of NSAIDs has been linked to an elevated risk of heart attack or stroke [63]. Additionally, there is a high risk of gastrointestinal adverse events associated with NSAIDs. At introduction, COX-2 inhibitors were thought to have a better safety profile but have been found to carry comparable cardiovascular risks to most other NSAIDs [64]. While alternative treatments such as opioids demonstrate effectiveness, their potential for habituation and addiction relegates them lower in the pecking order for chronic pain management [65]. Chronic usage of intra-articular corticosteroid injections has been reported to result in adverse events such as thinning of cartilage, which dampens the inclination toward using this local anti-inflammatory therapy regularly [66]. Various intra-articular treatments like stem cell therapy, platelet-rich plasma, or hyaluronan have uncertain efficacy, as their potential benefits beyond a placebo effect remain unclear [67–69].

Patient selection and indications

Patients were included for GAE because they had moderate to severe knee pain (VAS > 5), which was resistant to conservative therapy (muscle strengthening, physical therapy, anti-inflammatory drugs, and intra-articular injection of hyaluronic acid) for a minimum duration of 3 months. The exclusion criteria included grave osteoarthritic changes (Kellgren-Lawrence grade 3 or higher) [70], local infection, advanced sclerosis, malignancy and previous knee surgery [71–73].

At onset, there should be a complete evaluation of the patient by a thorough history and physical examination to identify the origin of the pain. Prior imaging is critical in patients with previous total knee arthroplasty, as the metallic infarct can hinder the visualization of target branches [74]. The data highlight factors such as higher BMI and the absence of angiogenesis evidence in imaging studies [75, 76] which may predict inadequate responses

Table 3 Classification of studies by level of evidence

Level of evidence	Author	Number of participants (*N*)
Case reports	Lauko et al. [40]	3
	Cusimano et al. [45]	1
	Correa et al. [50]	1
Case series	Kim et al. [39]	2
Cohort study	Padia et al. [34]	40
	Gorsi et al. [37]	10
	Shibuya et al. [38]	3
	Katoh et al. [43]	3
	Okuno et al. [44]	7
	Okuno et al. [46]	25
	Hwang et al. [21]	13
	Gremen et al. [47]	15
	Iwamoto et al. [48]	24
	Lee et al. [49]	14
	Inui et al. [52]	31
	Okuno et al. [44]	7
Randomized controlled study	Bagla et al. [35]	14

to TAE. Embolization procedures involving the elbow and shoulder joint have the same inclusion criteria [46, 48, 77]. Treatment for other joint pains, such as those in the hip, trapeziometacarpal and ankle joints, is still in its infancy and requires more data to establish standardized criteria [44, 50, 52].

Level of evidence

In medical research, the classification of studies by the level of evidence is critical for assessing the reliability and applicability of the outcomes. **Table 3** presents a range of studies from case reports to randomized controlled trials, each contributing uniquely to the understanding of TAE. Case reports include individual or tiny groups of cases, providing insights into unusual medical occurrences that may lead to more comprehensive investigations. This classification helps assess the strength of evidence behind current medical practices and may guide future research directions.

Challenges and future directions

The primary challenge faced is the credibility of the data obtained for the procedure, mainly from open-label case series or cohort bias, rendering them susceptible to selection bias owing to the lack of a control group. The small sample size of the studies hinders the identification of severe adverse effects. Additionally, most studies were unicentric and recruited relatively homogeneous populations, which calls into question the applicability of the data to the entire population. One of the best examples is the most extensive study on knee OA, where the mean BMI [59] was appreciably lower than the typical BMI observed in patients of North American and European descent with knee OA [57]. Another critical caveat with joint pain is that it gradually improves independently, which should not be ignored. More data on the types of embolic agents used in TAE need to be collected. Non-permanent agents such as IPM-CS have been hypothesized to lower the likelihood of adverse events [15].

In the future, multicenter trials involving operators of different expertise levels will become the need of the hour. Their importance is further highlighted by the complication of unintended embolization, which results in ischemia of articular and periarticular tissue [78]. A more significant number of prospective randomized trials, such as led by Landers et al. [59, 79], are the cornerstone for assessing the effectiveness of TAE for joint pain. Conducting randomized controlled trials for procedural interventions poses challenges. To counter these challenges, establishing guidelines could be crucial in maintaining trial quality, ensuring reproducibility, and enhancing broader applicability [80]. In the future, well-designed, multicenter randomized controlled trials involving operators with varying levels of expertise will be crucial to address these limitations and provide more robust evidence on the efficacy and safety of angioembolization. These trials should aim to recruit more diverse patient cohorts that are representative of the real-world clinical setting. Standardized guidelines for patient selection, procedural techniques, and outcome assessment should be established to ensure consistency and reproducibility across studies.

In addition to RCTs, longer term follow-up studies are needed to evaluate the durability of pain relief and functional improvements with angioembolization. Comparative effectiveness research directly comparing angioembolization to other treatment modalities, such as pharmacotherapy, physical therapy, and intra-articular injections, would also help clarify the relative merits of this approach. Further research is also warranted to optimize the technical aspects of the procedure, including the selection of embolic agents. Non-permanent agents like imipenem/cilastatin have been hypothesized to lower the likelihood of adverse events, but more data are needed to confirm this. Strategies to minimize the risk of unintended embolization and associated tissue ischemia should also be explored.

In addition, from a clinical standpoint Shibuya and Okuno recommend that GAE be combined with physiotherapy and weight management to subdue the residual pain that follows embolization procedures of the knee [38]. By addressing these research gaps through rigorous, well-designed studies, angioembolization for joint pain management can continue to evolve and solidify its position as a valuable treatment option for patients with refractory musculoskeletal conditions. **Figure 2** provides an overview of the challenges involved in TAE.

Conclusion

This study aimed to establish a comprehensive database of information to enable clinicians to have a better understanding

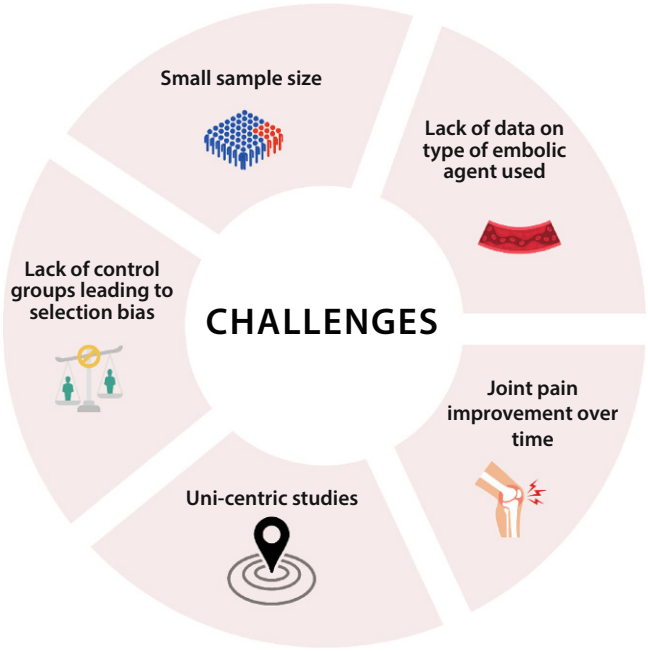


Fig. 2 ◀ Overview of methodological challenges in clinical research studies

of the use of transarterial embolization for joint pain. The results of this review are encouraging and provide optimism for the prospects of angioembolization in the management of joint pain. The critical contribution of this paper lies in laying down the guidelines for patient selection, conducting a comparative analysis with other existing treatments for joint pain, discussing the data published for angioembolization in the management of joints, and elaborating on the safety and efficacy of the treatment. The limitation of this review lies in the source where the bulk of the data was obtained; however, a more significant number of randomized trials are still being conducted and a better data set minimizing bias will soon be available.

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Availability of data and materials. No new data has been generated.

Declarations

Conflict of interest. N. Jeyaraman, F. Migliorini, V. Ramkumar, S. Ramasubramanian, B.P. Patro, N. Maffulli and M. Jeyaraman declare that they have no competing interests.
Ethical standards. For this article no studies with human participants or animals were performed by any of the authors. All studies mentioned were in accordance with the ethical standards indicated in each case. Consent to participate: not applicable. Ethical approval: this study complies with ethical standards. Consent to publish: not applicable.

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Angioembolisation bei der Behandlung von Gelenkschmerzen: aktuelle Konzepte

Gelenkschmerzen sind ein weit verbreitetes Beschwerdebild, das seinen Ursprung in entzündlichen und degenerativen Gelenkerkrankungen hat. Durch aktuelle Forschungen konnte die unangemessene Angiogenese als eine der Ursachen ausgemacht werden. Die Angioembolisation hat sich bei Nichtansprechen auf eine konservative Therapie als Behandlungsoption für diese Erkrankung herauskristallisiert. In dieser Übersichtsarbeit wird die Angioembolisation beschrieben, indem der Mechanismus, die Sicherheit, die Wirksamkeit, die vergleichende Analyse der Behandlung und der weitere Weg erläutert und die vorhandenen Daten zu dieser Behandlung zusammengefasst werden. Die Ergebnisse dieser Übersichtsarbeit untermauern die Bedeutung der transkathetergestützten arteriellen Embolisation als eine der wichtigsten Optionen für die Behandlung von Gelenkschmerzen, die auf eine konservative Therapie nicht ansprechen, und bezeichnen sie als einen der bedeutungsvollsten Ansätze. Eine Einschränkung dieses Reviews ist, dass die meisten Daten aus offenen Fallserien oder Fallberichten stammen.

Schlüsselwörter
Mechanismus · Klinische Studien · Vergleichende Analyse · Sicherheit · Wirksamkeit

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Abstracts zum Kongress für Kinder in Orthopädie und Unfallchirurgie 2024



Im März hat der **Kongress für Kinder in Orthopädie und Unfallchirurgie (KKOU)** gemeinsam mit der **37. Jahrestagung der Vereinigung für Kinderorthopädie (VKO)** und der **42. Jahrestagung der Sektion Kindertraumatologie (SKT)** in Münster unter der Leitung von Prof. Dr. Robert Rödl (Kongresspräsident und Chefarzt der Abteilung für Kinderorthopädie, Deformitätenrekonstruktion und Fußchirurgie am Universitätsklinikum Münster) stattgefunden.

Schwerpunkte des wissenschaftlichen Austausches waren:

- Kniegelenk
- Hand(gelenk)
- Hüftgelenk, neuromuskulär/Syndrome
- Intramedulläre Techniken
- Tumor
- Wirbelsäule
- Fuß

Die auf dem Kongress thematisierten intramedullären Verfahren beziehen sich auf die langen Röhrenknochen. Bei Kindern sind diese Techniken auch anwendbar, jedoch ergeben sich aufgrund der Wachstumszonen an den Enden der Knochen technische Probleme. Werden diese verletzt, kann der Knochen nicht mehr wachsen.

Ein weiteres großes Thema der Kinderorthopäden und -traumatologen ist die Prävention. Aber nicht nur das Verhindern von Unfällen, auch das frühe Erkennen von Fehlentwicklungen im Rahmen der Wachstumsschübe kann über den kindlichen Lebensweg entscheiden. Dabei geht es um Hüftfehlstellungen, Beinfehlstellungen, Rückenverbiegungen und Bewegungsmangel.

Die Abstracts können bis zum 31. Juli 2025 in einem e.Only-Supplement von *Die Orthopädie* kostenfrei auf Springermedizin.de gelesen werden.

Hier steht eine Anzeige.

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