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RESEARCH

International, consensus-based, indications and treatment options for knee arthroplasty in acute fractures around the knee

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Abstract

Background In the landscape of knee-related health issues there has been a notable shift in treatment protocols. Nowadays, there is a growing trend toward primary total knee arthroplasty (TKA) in the event of periarticular knee fractures. A review of the literature on TKA in acute knee fractures has been done in order to provide scientific evidence to the four statements submitted for voting to the members of the European Knee Society (EKS).

Materials and Methods A literature review has been performed around four topics of TKA in acute knee fractures, specifically: 1) The indications for TKA in acute knee fractures are undoubtful and clear; 2) Pre-existing osteoarthritis is not mandatory for the indication of TKA in acute fractures, while age, co-morbidities and type of fracture are; 3) A series of established criteria with scores to give indication for TKA (approved algorithm) is needed; and 4) This (complex) surgery must be performed in referral centers with all technical options and specific peri-operative management and post-operative care.

Results The panel of experts therefore believes that the indications cannot be considered undoubtful and clear. According to the literature up to the time of the consensus vote, there was no objective method for deciding on the treatment to offer the patient (Agree: 34.1%, Disagree: 61%, Abstain: 4.9%). It emerges that there are no mandatory conditions for the treatment of acute knee fractures with TKA (Agree: 32.3%, Disagree: 51.6%, Abstain: 16.1%). However, there are several characteristics to consider for a multifactorial evaluation rather than being limited to a single condition. While the consensus has highlighted a need for a scoring system to guide surgical decisions in periarticular knee fractures (Agree: 88.24%, Disagree: 8.82%, Abstain: 2.94%), research in the literature has confirmed that, to date, no validated algorithm exists. After the vote, a score was proposed, which requires validation. Although the panel of experts does not deem it necessary for this surgery to be reserved for reference centers (Agree: 32.35%, Disagree: 50%, Abstain: 17.65%), literature suggests that it is crucial that before undertaking knee arthroplasty in the setting of an acute fracture around the knee, the orthopedic surgeon is confident with all the necessary skills for a complex intervention that requires advanced knowledge and practical competence in osteosynthesis and revision TKA.

Conclusion This discussion on the questions voted by the panel of experts has allowed for an in-depth exploration of a topic of interest, assessing indications, contraindications, types of possible treatment, and the critical aspects to consider when treating an acute fracture around the knee with a prosthesis. It is important to consider that the choice must be carefully weighed, evaluating the risks and benefits, with an increasingly need for a scoring system for selecting the most appropriate treatment.

Keywords Acute knee fractures · Total knee arthroplasty · Scoring system · Osteoarthritis · Knee replacement

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Introduction

Arthroplasty, a procedure traditionally utilized for managing acute fractures of the proximal femur and complex fractures of the proximal humerus or elbow, is not commonly applied to complex knee fractures [1–5]. In the landscape of knee-related health issues, particularly acute fractures, there has been a notable shift in treatment protocols. While osteosynthesis was once the standard care for all acute fractures, with joint replacements being relegated to addressing degenerative diseases, recent times have seen a change driven by multiple pivotal factors [6, 7].

There are thoughtful reasons for selecting arthroplasty in treating certain complex knee fractures, akin to its use for hip or shoulder injuries. These include pre-fracture symptomatic osteoarthritis (OA), the fracture's complexity– especially in its articular components, the danger that fragile bones pose to secure fixation, and the critical need for prompt mobilization and the quick resumption of daily activity in older patients. This approach helps prevent the complications associated with long-term bed rest, which is a common challenge for the elderly population [8].

These considerations are especially relevant for the aging population, which is growing, particularly in Western countries where people now commonly live beyond 80 years [9]. This shift in demographics has led to a cohort of older patients with advanced functional needs. Clinicians treating fractures in this demographic are faced with complex cases, often involving patients with numerous health issues, weakened bone integrity, previous surgeries on the affected limb, advanced arthritis, and sometimes limited independence even before injury. It's important to realize that over 30% of people over 65 years old are dealing with serious chronic diseases or have multiple health conditions [1, 2, 9].

For these vulnerable patients, the primary goals are to enable early mobilization and quick return to weight-bearing activities [10, 11]. A long period of restricted movement and limited weight-bearing, which is necessary for the healing of fractures, is particularly hard on older patients, increasing their risk for widespread complications such as deep vein thrombosis, pulmonary embolism, pressure ulcers, and infections [12–14]. Additionally, prolonged immobilization correlates with increased mortality rates [6]. It is also critical to acknowledge that surgical opportunities are limited, as a secondary surgery could significantly worsen these patients' overall outcomes [15, 16].

Nowadays, in line with treatment practices for other joints, there is a growing trend toward primary TKA in the event of periarticular knee fractures [14, 17–22].

Methodology

The topic remains discussed in the literature and a solid consensus appears to be lacking. For this reason, the European Knee Society (EKS) organized a session at a closed meeting in Kitzbühel in January 2023, where a panel of experts shared their opinion on the most debated topics of TKA for acute knee fractures. A panel of experts was convened to weigh in on four different statements.

These are the four topics submitted to the audience:

1. The indications for TKA in acute knee fractures are undoubtful and clear.
2. Pre-existing osteoarthritis is not mandatory for the indication of TKA in acute fractures, while age, co-morbidities and type of fracture are.
3. A series of established criteria with scores to give indication for TKA (approved algorithm) is needed.
4. This (complex) surgery must be performed in referral centers with all technical options and specific peri-operative management and post-operative care.

For each of the proposed topics, the results of the consensus voting are presented, followed by a discussion of the topics based on the most significant literature published up to the time of the meeting where the voting took place, which is then supplemented by the most recent subsequent literature.

In January 2024, research was conducted to identify relevant articles concerning the different questions regarding fractures around the knee. The search was carried out using the PubMed, Embase, and Medline databases, spanning from their inception until December 2022, which is before the vote for the Delphi consensus. Scientific articles published subsequently, from January 2023 onwards, were incorporated into the discussion to support the outcome of the vote. For the selection of scientific articles, the 2020 Preferred Reporting Items for Systematic Reviews and Meta-Analyses Protocol (PRISMA) was employed. For each topic, the specific search criteria are reported, including the keywords. The inclusion criteria were English language studies that reported on the indications for knee prosthesis in acute periarticular fractures. The abstracts of the identified articles were reviewed. Articles were excluded if the title and abstract did not mention the indications for TKA acutely following periarticular knee fracture. Full-text articles were assessed if necessary.

Question 1

The indications for TKA in acute knee fractures are undoubtful and clear

Rationale

The presence of undoubtful and clear indications would allow all surgeons worldwide, with varied levels of experience, to provide homogeneous recommendations based on the expertise of experienced surgeons and evidence-based medicine. The goal is to offer patients the highest level of care possible, ensuring a satisfactory long-term recovery.

Literature queries

The following search keywords were used: "indication" and "knee arthroplasty" or "TKA" and "acute knee fractures" or "fracture around the knee".

Matching articles

From an initial search using the keywords, 43 articles were assessed. Upon screening of abstracts and full texts, 17 papers addressed the clarity of indications for TKA in acute knee fractures.

Statement

The treatment with osteosynthesis in peri-articular knee fractures remains the gold standard. In some cases, the choice to use TKA acutely can have a significantly positive impact on patient outcomes. There are general indications for treatment with TKA in acute knee fractures, but each case requires dedicated evaluation.

Delegate vote

Agree: 34.1%, Disagree: 61%, Abstain: 4.9%.

Discussion

According to the expert panel's vote, the indications for TKA in acute knee fractures are currently not undoubtful and clear. However, some studies in the literature, through reviews and instructional lectures, have reported categories of patients eligible for this type of treatment.

In an Instructional Lecture by Tampere et al., four main indications for primary arthroplasty for complex fractures around the knee are reported [23].

The foremost indications involve intra-articular fractures occurring in elderly osteoporotic patients who already have symptomatic end-stage OA [8, 16–20, 22–27]. Secondly, the use of arthroplasty may be the first choice for treating complex tibial plateau or distal femoral fractures in elderly osteoporotic patients where there is significant destruction of the articular surface and metaphysis, making reconstruction and internal fixation risky [8, 12, 17, 20, 24, 27–29]. Thirdly, TKA might be considered for treating pathological fractures of the distal femur and/or tibia in cases with limited bone stock or extensive condylar damage [30]. Lastly, arthroplasty could be considered as a last-resort option in rare cases involving young patients with complete destruction of the distal femur and/or proximal tibia, such as in highly complex high-energy fractures resulting from incidents like road traffic accidents, falls from heights, or sports injuries, which result in significant bone loss. This indication remains highly debated and requires a case-by-case evaluation. It's important to note that open reduction and internal fixation remain the preferred treatment in younger patients to preserve as much bone stock as possible and potentially facilitate arthroplasty in the future if necessary.

However, it is important to consider that arthroplasty treatment for post-traumatic OA can be technically challenging, with old scars, existing osteosynthesis devices, bone deficits, and instability that may lead to poorer outcomes and higher complication rates compared to acute arthroplasty treatment [31–33].

The indication for pre-existing OA was first challenged in a study published by Benazzo et al., where the authors suggested that the fracture characteristics alone could be an indication for TKA [18]. In fact, fractures around the knee, if treated with osteosynthesis, can lead to prolonged reduction in ambulation and joint functionality, with a 25% mortality rate at 1 year [34].

In a study published by Quattrini et al., after the consensus vote, it was highlighted that ORIF in unicompartmental tibial plateau fractures yields good outcomes [9]. For this reason, the authors suggest opting for acute TKA in tibial fractures under specific conditions such as age, poor bone quality, and pre-existing knee OA. Furthermore, some studies argue that poor bone quality is a condition that introduces uncertainties regarding the stability and durability of internal fixation, making osteoporosis an ideal setting for primary TKA indication in acute knee fractures [35, 36].

In conclusion, indications for arthroplasty treatment for acute fractures around the knee are outlined in various studies. However, authors suggest that the choice should be made on a case-by-case basis, taking into consideration specific characteristics and expectations [9, 18, 23]. Returning to the initial question, the panel of experts therefore believes that the indications cannot be considered undoubtful and clear. Consequently, according to the literature up to the

time of the consensus vote, there was no objective method for deciding on the treatment to offer the patient.

Question 2

Pre-existing osteoarthritis is not mandatory for the indication of TKA in acute fractures, while age, co-morbidities and type of fracture are.

Rationale

The definition of the key parameters to consider in choosing the appropriate treatment for acute knee fractures is a crucial factor in optimizing patient care. It is therefore necessary to define the *conditio sine qua non* to be evaluated when indicating TKA in the trauma setting.

Literature queries

The following search keywords were used: "Pre-existing osteoarthritis" or "elderly" or "type of fracture" or "comorbidity" and "knee arthroplasty" or "TKA" and "acute knee fractures" or "fracture around the knee".

Matching articles

From an initial search using the keywords, 57 articles were assessed. Upon screening of abstracts and full texts, 33 papers evaluated the impact of patient pathological conditions on the choice of treatment with TKA in acute knee fractures.

Statement

The primary indication for TKA in acute fractures is pre-existing osteoarthritis. However, several studies in the literature suggest that it is not a necessary condition for treatment selection, but rather that the evaluation should be multifactorial.

Delegate vote

Agree: 32.3%, Disagree: 51.6%, Abstain: 16.1%.

Discussion

The result of the vote indicates that about half of the voters disagreed, while only about one-third agreed with the proposed question.

In the previous discussion, we reported that several studies in the literature indicate the presence of pre-existing end-stage OA as the main indication [8, 16–20, 22–27]. As reported by Saini et al., this applies not only to traumatic fractures but also to stress fractures of the tibial plateau in the presence of OA [37].

However, in a study published by Benazzo et al., the necessity of pre-existing OA was called into question [18]. In fact, the authors argued that in the individual assessment of the specific case, severe fracture comminution, comorbidities, and the need for early mobilization could also constitute an indication for arthroplasty treatment.

In a study by Tampere et al., categories of indication for TKA in acute knee fracture have been identified, with cases where even severe comminution in complex fractures in osteoporotic patients or in young patients with high-energy trauma, or pathological fractures, may be appropriate indications [23].

However, certainly, the presence and severity of pre-traumatic OA can significantly influence the treatment choice, favoring TKA over osteosynthesis.

Additionally, Shi et al. conducted a large-scale study involving patients aged over 65 with distal femoral fractures, which revealed a low 10-year cumulative incidence of conversion to arthroplasty after ORIF [7]. Moreover, they found no significant difference in long-term reoperation-free survival rates between patients who underwent ORIF compared to those who received primary arthroplasty. However, primary arthroplasty was associated with significantly higher rates of acute wound or joint infection.

In a recent study conducted after the consensus vote, Quattrini et al. proposed a multifactorial scoring system for indicating TKA in acute knee fractures, wherein the presence of severe pre-existing OA is a parameter that influences the indication [9]. This scoring system will be further discussed in the discussion of question 3.

Although pre-existing OA is not mandatory for the indication of TKA in acute fractures, it remains the most consistent indication.

in an Instructional Lecture published by Tampere et al., two categories of patients were identified where there might be an indication irrespective of advanced age: those with pathological fractures of the distal femur and/or tibia, and young patients with complete destruction of the distal femur and/or tibia [23].

With the exception of these borderline cases, age is one of the key criteria to consider. In fact, in the literature, treatment with TKA in acute fracture is almost exclusively reserved for elderly patients [8, 17, 18]. Many studies have emphasized the importance of age as one of the main criteria in choosing arthroplasty treatment, with elderly patients being the best candidates for this type of treatment [35, 38, 39].

On this point, it is useful to emphasize that the goal of acute TKA treatment is early mobilization and prompt

resumption of weight-bearing activities, aiming to avoid prolonged immobilization, which can lead to an increased mortality rate [10, 11, 40, 41]. In this regard, elderly patients are precisely those at higher risk of prolonged immobilization and are therefore the category of patients who potentially benefit the most from arthroplasty treatment [15, 18].

In terms of the patient's general health conditions, several studies in the literature agree that they should be a factor that can impact the treatment choice [8, 18, 23]. Indeed, the poorer the health conditions, the greater the risk of complications from prolonged immobilization, and consequently, the higher the mortality rate in case of delayed functional recovery [41, 42]. In the elderly population, the impact of comorbidities is significant, with around 30% of individuals aged over 65 years dealing with serious chronic ailments or multimorbidity [1, 2].

Moreover, the impact of comorbidities can be significant in terms of increased post-operative complications and functional recovery capacity [43, 44].

The presence of diabetes significantly influences the outcomes of all orthopedic procedures, being associated with wound healing issues, infection risk, and impaired bone metabolism. However, the effect of diabetes on surgical outcomes can vary greatly among patients, depending on factors such as glycemic control and duration of the disease. Therefore, although diabetes may not constitute an indication for treatment with osteosynthesis rather than TKA, diabetic patients require individualized diabetes management in orthopedic surgery [45, 46].

Similarly, smoking is also a negative predictive factor for orthopedic surgical intervention, adversely affecting bone and tissue healing and increasing the risk of complications post-surgery [47, 48].

Malnutrition can hinder wound healing, weaken the immune system, and contribute to postoperative complications. Therefore, nutritional assessment in preoperative care is crucial in surgical treatment decision-making to optimize surgical outcomes [49].

Regarding fracture characteristics, the literature unanimously agrees that the indication for TKA is stronger with greater articular involvement and comminution [8, 18, 23].

In conclusion, in accordance with the expert panel's vote, it emerges that there are no mandatory conditions for the treatment of acute knee fractures with TKA. However, there are several characteristics to consider for a multifactorial evaluation rather than being limited to a single condition.

Question 3

A series of established criteria with scores to give indication for TKA (approved algorithm) is needed.

Rationale

By utilizing scores grounded in evidence-based medicine, formulated from clinical data and endorsed by multicentric studies, it would be possible to enhance the precision of surgical indications for patients requiring treatment for acute fractures around the knee.

Literature queries

The following search keywords were used: "algorithm" or "score" and "knee arthroplasty" or "TKA" and "acute knee fractures" or "fracture around the knee".

Matching articles

From an initial search using the keywords, 49 articles were assessed. Upon screening of abstracts and full texts, only one article was found to be consistent with the topic, published in January 2024, after the consensus.

Statement

The literature provides guidance on the key criteria to consider in the case of fractures around the knee. However, these criteria need to be interpreted by the orthopedic specialist, who must determine which category the patient falls into, that is whether they can benefit immediately from osteosynthesis or TKA.

Delegate vote

Agree: 88.24%, Disagree: 8.82%, Abstain: 2.94%.

Discussion

This question garnered the most agreement in the voting on the topic of TKA for acute fractures around the knee. Indeed, according to 88.24% of the expert panel, there is a need for established criteria with validated scores that can define the indications for knee arthroplasty in the setting of acute fractures.

Medicine, and by extension orthopedics, is increasingly driven by evidence-based practices. The implementation of validated scores, algorithms, or any type of flow-charts strengthens medical decision-making [50, 51].

Knee replacement surgery is well exemplified by this trend: there are validated scores and algorithms in the field of infection, in the selection of the prosthetic implant, addressing failures of primary TKA, and in the measurement of Patient-reported Outcome Measures (PROMs) [18, 52–55]. However, at the time of the consensus, there was no

scoring system or algorithm for indicating knee arthroplasty in acute knee fractures. Furthermore, to our knowledge, no one had proposed a score that could aid orthopedic surgeons in the surgical decision-making process for complex knee fractures. In the event of a fracture around the knee, the choice of surgery, whether osteosynthesis or arthroplasty, was at the surgeon's discretion, supported only by some generic criteria suggested in the literature.

Following the vote at the closed meeting in Kitzbühel in January 2023, an Italian multicentric working group developed a score for selecting the appropriate treatment in the presence of fractures around the knee. The score is based on the functional outcomes achieved and the associated risk factors for treatment failure, specifically comparing osteosynthesis with replacement, which were evaluated by a team of surgeons with varying degrees of experience. Therefore, in January 2024, Quattrini et al. published a score known as the "Total Knee Replacement Indication Scoring System for Knee Fractures Based on AO Classification (TKRISS)" [9].

The TKRISS score is based on various factors: age, AO/OTA fracture classification, Clinical Frailty Scale (CFS), presence of diabetes, smoking, and malnutrition.

The total score is derived by adding up the individual points for each factor. A higher score indicates a stronger recommendation for undergoing TKA following a fracture.

The scoring system categorized patients into three levels of indication for TKA following an acute knee fracture: low indication, moderate indication, and indication. The low indication group represents patients who are preferably candidates for osteosynthesis, while patients belonging to the indication level represent a stronger rationale for TKA. Nevertheless, the system acknowledges the importance of clinical assessment, and that specific considerations unique to each patient may affect the ultimate choice of treatment.

Nowadays, clinical and surgical decisions are increasingly based on the use of algorithms and scores, which can also be guided by artificial intelligence, both in the realm of knee injuries and arthroplasty treatment [56, 57].

In conclusion, while the consensus has highlighted a need for a scoring system to guide surgical decisions in periarticular knee fractures, research in the literature has confirmed that, to date, no validated algorithm exists. The TKRISS could represent a useful tool for healthcare professionals to assess the indication for TKA after a knee fracture, however, further clinical research and validation are needed to optimize the scoring system and make it applicable to the knee trauma setting. The interest of the panel of experts is indicative of a growing concern for this issue, and it is hoped that this score will soon be validated, defining an algorithm that can be applied by all orthopedic surgeons.

Question 4

This (complex) surgery must be performed in referral centers with all technical options and specific peri-operative management and post-operative care.

Rationale

Advanced skills in trauma and orthopedic surgery are not necessarily found concurrently in trauma experts and orthopedic specialists focusing on knee pathologies. Channeling these patients to selected centers could be advantageous for patient care, both in terms of peri-operative management and post-operative care, as well as in treatment selection that is not limited to one's own sectoral expertise.

Literature queries

The following search keywords were used: "Center of care" or "referral center" and "knee arthroplasty" or "TKA" and "acute knee fractures" or "fracture around the knee".

Matching articles

From an initial search using the keywords, 36 articles were assessed. Upon screening of abstracts and full texts, 7 papers dealt with the importance of specific surgical skills.

Statement

The treatment of knee fractures with TKA often necessitates the use of implants with increased constraint, prosthetic stems, cones, sleeves, or augments. Additionally, supplementary osteosynthesis may be required. Therefore, this type of surgery can often demand advanced skills in both trauma and orthopedic surgery.

Delegate vote

Agree: 32.35%, Disagree: 50%, Abstain: 17.65%.

Discussion

The result of the vote highlights that exactly half of the voters disagreed, while only about one-third agreed with the proposed question.

It is critical to clarify that the panel of expert voters deals daily with high-level primary and revision knee arthroplasty, although a high percentage of these orthopedists work in elective surgery centers where traumatic pathology is not routinely treated.

There are various studies reporting satisfactory results in treating distal femur fractures or proximal tibia fractures with TKA. Benazzo et al. have reported outcomes with Knee Society Score (KSS) as good or excellent in 83% of patients treated for distal femur or proximal tibia fractures, with an average follow-up of 12 months [18]. Constrained condylar knee implants or megaprostheses had been used. Parratte et al. reported satisfactory results on 26 patients treated in 8 different French centers, with an average follow-up of 16 months [17]. The implants used were 21 cases of primary TKA, 5 rotating hinge prostheses, and 1 hinge prosthesis. The IKS knee score was applied. Ebied et al., in a study on 27 patients treated for periarticular knee fractures, both femoral and tibial, with an average follow-up of 6 years, reported a KSS of 80 with a 100% survival rate at the final follow-up [29]. These results were achieved through the use of constrained condylar knee or rotating hinge implants for distal femur fractures and primary TKA with a tibial stem for proximal tibia fractures.

Wang et al., in a study involving 24 patients treated for distal femur fractures with primary TKA using a femoral stem, reported a Hospital for Special Surgery Knee-Rating Scale (HSS) score of 86.2 with a survival rate of 100% at a follow-up of 38 months [28].

Boureau et al., in a study on 21 patients treated for distal femur or proximal tibia fractures with a rotating hinge implant, achieved a 100% survival rate and an IKS knee score of 78.4 at a 31-month follow-up [20].

Sabatini et al., in a study on 11 patients treated for proximal tibia fractures, reported satisfactory results at an average follow-up of 28 months [16]. Both primary TKA and constrained condylar knee implants were used, with a KSS of 74. Quattrini et al. reported on 20 patients treated for distal femur or proximal tibia fractures, with implants including primary TKA, constrained condylar knee, or hinge megaprosthesis [9]. 68.4% of the patients reported excellent or good results at an average follow-up of 25.3 months.

[23].

Severe comminution can result in significant bone loss, which can be managed through autografts, allografts, or, for smaller defects, synthetic bone. An alternative, especially in osteoporotic bones, may be the use of trabecular metal cones sleeves or stems [58–60, 23].

In addition to bone comminution, ligamentous injuries also play a critical role. Tampere et al. have proposed an algorithm for choosing the prosthetic implant in the treatment of complex fractures around the knee [23]. The authors emphasize that arthroplasty for complex knee fractures requires a thorough knowledge of the basic rules of revision surgery.

Among the challenges of arthroplasty treatment in acute fractures around the knee is the need to consider the risk of iatrogenic fracture or intraoperative extension of the fracture line [61, 62]. This situation can lead to an intraoperative change of plan, requiring an extension of the surgical approach, additional osteosynthesis of high technical difficulty, a change of the chosen implant and its constraint, and, in extreme cases, the need to switch to a megaprosthesis [63].

Although the literature is limited to some case reports, the possibility of integrating robotic techniques into TKA for fractures around the knee is emerging [19, 64–66].

There are no studies or evidence in the literature that establish the requirement for this type of surgical treatment to be performed in referral centers. However, the literature highlights how the choice of constraint, joint-line restoration, component rotation, bone defect filling, and implant fixation follow the same principles as those applied in revision TKA or oncological TKA reconstruction, and that the goal of surgery is to provide a stable, mobile knee that permits immediate full weight-bearing [18, 23].

In conclusion, it is crucial that before undertaking knee arthroplasty in the setting of an acute fracture around the knee, the orthopedic surgeon is confident with all the necessary skills for a complex intervention that requires advanced knowledge and practical competence in osteosynthesis and revision TKA. It is also essential that the facility has all the implantable materials that might be needed to complete the treatment.

Conclusions

This discussion on the questions voted by the panel of experts has allowed for an in-depth exploration of a topic of interest, assessing indications, contraindications, types of possible treatment, and the critical aspects to consider when treating an acute fracture around the knee with a prosthesis.

The progressive increase in interest in this topic over the last 10 years, with an exponential growth in studies published in the last two years, highlights that TKA for acute knee fracture is a treatment to be considered during surgical decision-making.

Of the four questions agreement was achieved on only one question (number 3) stating that decision making should be based on established criteria and validated scores.

For the other three questions no consensus was achieved and this confirms the need for solid and validated criteria which are at the moment lacking in the literature, a part for one recently published manuscript [9], leaving the choice for this treatment mainly on the surgeons' experience.

It is important to consider that the choice must be carefully weighed, evaluating the risks and benefits, with an

increasingly need for a scoring system for selecting the most appropriate treatment.

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Data availability The Manuscript has associated data deposited in a separate data repository.

Declarations

Ethical approval No ethical approval needed.

Informed consent No consent needed.

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