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Review

Current Concepts about Calcaneal Fracture Management: A Review of Metanalysis and Systematic Reviews

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Abstract: Background: The fracture of the calcaneus is the most common traumatic lesion of the hindfoot and can cause severe disability with social and economic sequelae. Since 1980, an increasing number of studies and new technologies have led to an improvement in the management of calcaneal fractures, but treatment is still controversial. The purpose of this review was to investigate the secondary scientific literature to detect the optimal management of calcaneal fracture. Methods: A MEDLINE search via PubMed was conducted. A total of 4856 articles were identified, and only meta-analyses and systematic reviews were included. Results: 59 articles with more than 10,000 calcaneus fractures were examined, and the results were divided into various topics. Most articles agree on the superiority of surgical treatments compared to conservative ones. Moreover, minimally invasive access to the sinus tarsi showed better results and fewer complications than traditional extended lateral access. Also, reduction and osteosynthesis with percutaneous and/or minimally invasive techniques seem to provide better outcomes when compared to open treatments. Conclusions: The management of calcaneal fractures requires an individualized treatment plan based on the functional demands of the patient, the type of fracture, and associated injuries. New technologies and further studies can lead to an improvement in the management of calcaneal fractures.

Keywords: calcaneus; calcaneal fracture; ORIF; conservative; operative; extensile lateral approach (ELA); sinus tarsi approach (STA)

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1. Introduction

Among the bones of the foot, the calcaneus is the largest. It has an irregular shape and is essential in supporting weight, especially while walking and running. Its inner part consists of cancellous bone with non-uniform density, whereas the outer shell consists of thin cortical bone [1–6]. Calcaneal fractures usually develop with a traumatic mechanism in compression due to forces that cause the collapse of the bone, mainly the spongy bone [7,8]. In particular, falls from heights or high-energy road accidents, which cause a vertical impact on the heel, represent the most frequent injury mechanisms, and in 70–75% of cases, they cause intra-articular fractures [9]. Among the fractures of the hindfoot, the calcaneal ones are the most common, representing 61% of fractures of the tarsus and about 2.6% of total body fractures [3,10–12].

Temporary and permanent disabilities are inexorable consequences of calcaneal fractures with socio-economic and psychological repercussions. This is mainly due to the loss of the bone shape of the articular surfaces in height, width, and incongruity, which evolves into calcaneal malunion and post-traumatic osteoarthritis, affecting standing, walking, and jumping [6]. Sanders type II and type III are the most common patterns of fractures involving the posterior subtalar facet. Associated injuries are common and include ipsilateral fractures of the talus or fibula, lesions of the lateral ligament complex, dislocation of the fibula tendons, entrapment of the flexor hallucis longus tendon, as well as other body fractures [13]. For a complete diagnosis, an MRI examination can therefore be useful [14]. Soft tissue conditions are also a problematic issue. The management and surgical strategy to treat the fractures of the calcaneus have been extensively discussed over the past years, and many papers show that this topic is still a challenge.

Therapeutical options include non-surgical conservative treatment, closed reduction and external fixation with Kirschner wires or external fixator, closed reduction and internal fixation (CRIF) with screws or nail, closed reduction with calcaneoplasty, open reduction and internal fixation (ORIF) with plate, arthroscopic-assisted reduction and internal fixation (ARIF), arthroscopic reduction and external fixation (AREF), subtalar arthrodesis, in addition to bone or derivates grafting. To date, the best calcaneal fracture management is still controversial. We aimed to review the secondary scientific literature to investigate the therapeutic option/s for the optimal management of calcaneal fractures.

2. Materials and Methods

On 18 November 2022, we performed a MEDLINE search via PubMed by using the following keywords: "calcane AND fracture", following the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines [15]. The obtained results were filtered only for meta-analyses and systematic reviews without any language or time restrictions. Studies on live humans and cadavers were included.

According to the PICO framework, the population, intervention, comparison, and outcomes were identified as follows: "Population" included patients affected by calcaneal fracture; "Intervention" was any kind of conservative and surgical treatment, and the various interventions were compared with each other. "Outcomes" consisted of operation time; intraoperative and postoperative blood loss; intraoperative X-ray radiation; complications (i.e., delayed wound and/or bone healing, infection, and complex regional pain syndrome [CRPS]), quality of reduction; patients' satisfaction, pain, and ability to return to the same work and to wear the same shoes as before the fracture; and finally, the American Orthopedic Foot and Ankle Society (AOFAS) score, Böhler angle, Gissane angle, calcaneal width, calcaneal height, and loss of fracture reduction. Selected articles were reported and grouped based on the main topic, number of reviews, number of articles compared, number of patients, and results.

3. Results

3.1. Articles Selection and Data Extraction

In the scientific literature, we found 4856 articles about calcaneal fracture from 1945 to 18 November 2022, with an increasing number from 1980 (Figure 1).

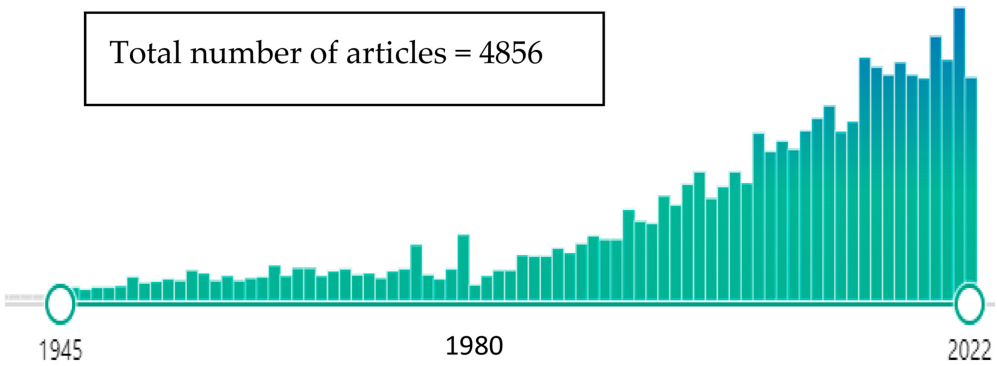

Figure 1. Increasing number of studies about calcaneus fracture indexed in Pubmed/Medline.

Including only the meta-analyses and systematic reviews, the total pool of articles was 105, and all of them were published from 1997 to 18 November 2022. 46 out of the 105 papers were excluded because they did not focus on calcaneal fracture. Thus, we included a total of 59 articles that discussed the management of calcaneal fracture, and they were divided as follows: 25 meta-analyses, 24 systematic reviews, and 10 for both (Figure 2).

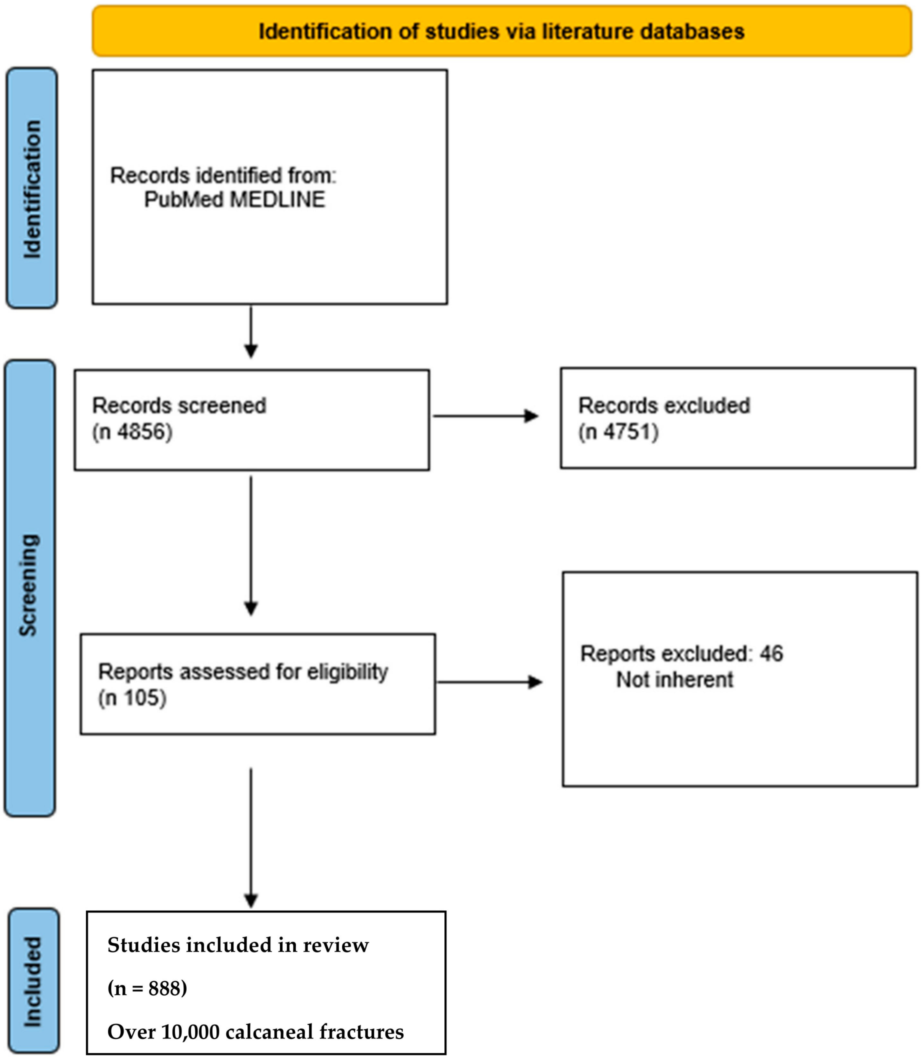

Figure 2. PRISMA flow chart.

The total number of articles analyzed in all the systematic reviews and/or metanalyses was 888, with over 10,000 calcaneal fractures treated. Many topics have been covered in the reviews (Table 1).

Table 1. Research results according to the topics covered by the various systematic reviews and meta-analyses of the literature.

TOPIC	N Metanalyses and/or Systematic Reviews	N Articles Compared	Results
STA vs. ELA [1–6,10,16–21]	13	8 8 7 8 X 12 15 5 27 9 8 7 8	STA > ELA 9 STA = ELA 4
Conservative treatment vs. surgical treatment [11,12,22–30]	11	8 10 18 8 7 4 7 7 13 8 18 4	Conservative treatment < surgical treatment 11 Conservative treatment = surgical treatment 1
Complications and soft tissues [31–34]	4	123 10 26 34	ELA experienced the most frequent complications PA better results The state of the overlying tissues is the + important predictor No difference between POWI and POWC in the countries
ARIF vs. AREF [35,36]	2	32 8	ARIF = others treatments ARIF > into diagnosyis
ORIF vs arthrodesis [36,37]	2	14 9	ORIF > arthrodesis in Sanders type II/III ORIF = arthrodesis in Sanders type IV
3D-printed-assisted [38]	1	9	"Excellent and good outcome, shorter operation time, less intraoperative blood loss, fewer intraoperative fluoroscopies, fewer complications".
Cannulated screws vs. ORIF [9,39]	2	5 7	Same functional results Screw > ORIF for complications, quality of reduction, surgical timing
Dislocated fractures [13]	1	4	"Timely surgical intervention is essential for satisfactory clinic outcomes".

Table 1. *Cont.*

TOPIC	N Metanalyses and/or Systematic Reviews	N Articles Compared	Results
Outcomes between treatments [13,40–45]	6	4 7 25 3 2 17	"Platelet-rich fibrin (PRF) (87.0%), MILA (52.9%), STA (46.6%), ELA (40.4%), nonoperative (23.1%). In terms of excellent and good satisfaction ratings, the treatments were ranked as follows: STA (96.2%), ELA (66.8%), PRF (34.9%), and nonoperative (2%). In terms of incision complications, the treatments were ranked as follows: PRF (84.1%), MILA (80.0%), STA (35.8%), and ELA (0.1%)". "Results showed no difference in residual pain, but favoured surgical management on ability to return to the same work and to wear the same shoes as before the fracture". "Displaced calcaneal fractures are treated surgically from 1 level I evidence study, 1 level II, and multiple studies with less than level II evidence, with open reduction and internal fixation as the method of choice. If the fracture is less complex, percutaneous treatment can be a good alternative according to current level 3 and 4 retrospective data". "The results from the current data appear to be promising; however, the lack of statistical power and inconsistent documentation have made it difficult to determine any superiority. The complication rates were much lower than those with open procedures, regardless of the technique. The percutaneous fixation technique appears to be a favorable option for displaced intra-articular calcaneal fractures. Percutaneous fixation using Kirschner wires presented the best results, however, evidence is insufficient to assert superiority of this treatment in comparison with other surgical techniques. Sanders II/III"
Pedobarography for outcomes [46]	1	9	"As a prediction tool, it should be more standardised. may be useful in developing customized aids such as insoles, aiming for a more individualized improvement".
Circular external fixator [47]	1	11	"Pin site infections were common (22.6%), serious complications, including deep infection (0.8%), wound infection (1.6%), and complex regional pain syndrome (0.8%), were exceedingly rare".
Open fractures [48]	1	18	The degree of exposure affects the result, especially on the wound healing time
Bone plug [15,49]	2	32 9	"Bone grafts achieved better AOFAS scores than the non-bone graft group. The two groups had similar results in Böhler angle, Gissane angle, calcaneal width, and calcaneal height. No increased risk of postoperative complications was identified".
Percutaneous osteosynthesis vs. ORIF [50–52]	3	15 18 9	No differences in functional scores ORIF < in wound complications

Table 1. *Cont.*

TOPIC	N Metanalyses and/or Systematic Reviews	N Articles Compared	Results
Peroneal tendons instability [53]	1	9	"Prevalence of peroneal tendon instability is associated with intraarticular calcaneal fractures and increases with the severity of the fracture".
Timing of load-bearing [54]	1	72	"The adverse sequelae which are assumed to be associated with starting partial weightbearing already within six weeks after internal fixation of calcaneal fractures, is not supported by literature data".
Osteosintesys on cadaver [55]	1	14	"None of the studies found a significant difference in favor of any of the fixation methods".
Percutaneal osteosintesys [56]	1	46	"Best outcomes for the minimal invasive open surgical treatment of calcaneal fractures"
Cementation with calcium phosphate [57]	1	14	"Lower prevalence of pain at the fracture site"; loss of fracture reduction
Arthrodesis in Sanders type IV [58,59]	2	7 22	"Good results considering the severe nature of the injury".

3.2. Surgical Approaches

The sinus tarsi approach (STA) was compared to the extended lateral approach (ELA) in 13 papers. A total of 9 out of the 13 papers supported the superiority of minimally invasive STA versus ELA, while the other 4 papers declared no statistical difference between them [1–6,10,16–21].

In general, all the papers underlined the superiority of STA to ELA due to anatomical reduction of the calcaneus, reduction of incision complications incidence, and shortened operative time and postoperative stay [3]. No differences were found in the clinical efficacy of STA versus ELA in treating displaced intraarticular calcaneal fractures (DIACF) [5]. Taken all together, STA can be considered more effective than ELA in the treatment of calcaneal fractures, with the advantages of less intra-operative bleeding, a higher (and better) rate of foot function, lower incidence of postoperative complications, and, thus, higher safety [4]. Moreover, statistically significant differences were found in wound complications, superficial infection, sural nerve injury, visual analog scale (VAS), the American Orthopaedic Foot & Ankle Society (AOFAS) score, operative time, time from trauma to operating room, calcaneal height, and postoperative Bohler's angle, where all favored the minimal incision approach [6].

3.3. Surgery vs. Conservative Treatment

The surgical approach was compared to conservative treatment in 12 studies, and 10 of these recognized higher effectiveness in the surgical approach, and only 1 did not show any significant statistical difference between these two strategies [11,12,22–30].

3.4. Complications

Complications and soft tissues were analyzed in four articles, and two of these stated that the most frequent complications occurred using the ELA. All articles pointed out that the clinical condition of the overlying soft tissues is the most important predictor of complication. Moreover, one article found that there is no statistically significant difference between postoperative wound closure complications throughout different countries [31–34], whereas another one mentioned that bone graft, diabetes, no drainage, and fracture severity were all associated with an increased risk of wound complications after ORIF.

3.5. Arthroscopy

ARIF was compared to AREF in two articles, and both demonstrated good results in the outcomes but without statistically significant differences compared to traditional treatment [35,36].

3.6. ORIF vs. Arthrodesis

ORIF was revealed to be better in the results with respect to arthrodesis in Sanders type II and type III fractures in two articles, while for Sanders type IV, there was no statistically significant difference between the two treatments [36,41].

3.7. 3D Printing

Three-dimensional-printed-assisted ELA surgery showed a higher rate of excellent and good outcomes, shorter operation time, less intra-operative blood loss, fewer intra-operative fluoroscopies, and fewer complications, according to one review article [37].

3.8. Percutaneous Screws vs. ORIF

The two reviews dealing with cannulated percutaneous screws versus ORIF showed that there are no statistically significant differences between these two treatments in the outcomes, but it seems that using the screws diminishes the risk of complications and surgical timing [9,38].

3.9. Fracture Dislocation and Timing

The review regarding fracture dislocations showed that the time between diagnosis and treatment is the most important predictive factor of the outcomes [39].

3.10. Various Treatments

Various treatments were compared in six papers. In terms of excellent and good satisfaction ratings, the treatments were ranked as follows: STA (96.2%), ELA (66.8%), PRF (34.9%), and nonoperative (2%). Regarding incision complications, the treatments were ranked as follows: PRF (84.1%), MILA (80.0%), STA (35.8%), and ELA (0.1%) [13,40–45].

3.11. Pedobarography

One article talked about pedobarography and showed that it could be a prediction tool for outcomes, but it should be more standardized [45].

3.12. Circular External Fixator

The results of the review that discussed the circular external fixator suggested its utility in treating this kind of lesion [46].

3.13. Open Fractures

The degree of fracture exposure in open fractures affected the result, especially in the healing time of the wound [47,48].

3.14. Bone Graft

Two reviews proved the superiority of bone grafting in terms of AOFAS score with respect to the non-bone graft [15,49]. The two treatment groups showed comparable outcomes regarding the Böhler angle, Gissane angle, calcaneal width, and calcaneal height with no increased risk of postoperative complications [49]. Moreover, one study reported that patients treated with bone graft could return to full weight-bearing earlier, yet the functional and efficacy outcomes appeared to be similar with or without bone grafting [16]. One study also showed that bone graft represents a risk factor (OR, 1.74; $p < 0.01$) for wound complications of closed displaced intra-articular calcaneal fractures (CDICFs) after ORIFs [32].

3.15. Percutaneous Osteosynthesis vs. ORIF

Percutaneous osteosynthesis was compared to ORIF in three reviews, but no statistically significant differences in functional scores and results were found, but ORIF seems to be worse in wound complications [49–51].

3.16. Peroneal Tendon Instability

One review showed that instability of the peroneal tendons is frequently associated with intra-articular fracture of the calcaneus, and incidence increases with the severity of the fracture [52].

3.17. Weight-Bearing Timing

Timing in weight-bearing is addressed in one review as a prediction tool, and even with early weight-bearing, the outcome does not change [53].

3.18. Cadaver Osteosynthesis

One article investigated various osteosynthesis treatments on cadavers, finding no significant differences [54].

3.19. Percutaneous Osteosynthesis

One article focused on the better results obtained with percutaneous osteosynthesis [55].

3.20. Calcium Phosphate vs. Bone Graft

Calcaneus filling with calcium phosphates showed better results compared to autogenous bone grafts in terms of pain and loss of fracture reduction [57].

3.21. Primary Arthrodesis

Two reviews reported that "primary arthrodesis in the treatment of Sanders type-IV comminuted displaced intra-articular calcaneal fractures provided overall good results considering the severe nature of the injury" [58,59].

4. Discussion

From the review of the secondary scientific literature, we can understand that, to date, the optimal calcaneal fracture management can be considered controversial. Although treatment options are in continuous evolution and are supported by research from surgical techniques to biomaterials and from tissue engineering to regenerative surgery, the field of calcaneal fracture is particularly challenging [60].

Before the advent of antibiotics in the 1920s, calcaneal fractures were treated exclusively conservatively, avoiding surgical procedures with too high an infectious risk. In the last 100 years, however, there has been an evolution of surgical techniques dictated by the growing functional demands of patients alongside the improvement of synthesis devices and instruments such as fluoroscopy, intraoperative CT, and arthroscopy. Lately, a promising contribution has also been provided by tissue engineering and regenerative medicine.

The development and evolution of the treatment of calcaneal fractures over time sees a growing expansion of the surgical indication also due to the evolution of the synthesis devices. In particular, the anatomical plates with low profile and angular stability have brought undeniable advantages.

Despite the notable improvements made in the treatment of calcaneus fractures, it is still not fully understood whether and when closed reduction is preferable to open reduction. It, therefore, still remains to be discovered which is the best treatment, which must, in any case, take into account the type of fracture as well as the specific characteristics of the individual patient and the local extra-osseous situation.

4.1. Surgery vs. Conservative Treatment

Papers dealing with operative versus conservative treatment show the superiority of surgery [1–6,16–21]. Patients surgically treated had fewer problems with shoe fitting, and most of them returned to their preinjury activity and work; however, the AOFAS score did not reveal a statistically significant difference [61]. Regardless, the surgical treatment should be tailored to each patient, considering that if surgical treatment can increase the probability of returning to previous activities, on the other hand, the risk of complications is greater. However, in the case of an intra-articular displaced fracture of the calcaneus, reduction, and osteosynthesis can prevent early subtalar arthrodesis [21].

4.2. Complications

The most reported complications are skin problems with eventual infection, residual pain, and development of osteoarthritis [6,62–66]. Many studies agree that the most important prognostic, predictive factor of surgical-treated fractures is the state of the soft tissues. In addition, the post-ORIF complication risk is increased with bone graft, diabetes, no drainage, and fracture severity [31–34].

As with other surgeries, even for calcaneus fractures, the risk of infection increases with the increase in exposure time; therefore, as known, it is suggested to administer an additional dose of prophylactic antibiotic after 2–3 h of surgery. Obviously, a stratification of risk factors must always be carried out for an individualized estimate and management [67].

4.3. Surgical Approach

Results are in agreement that STA was able to obtain better results while ELA experienced a higher number of complications. The benefits highlighted for STA are shorter operation time, lower incidence of complications, and overall better safety [10].

Unfortunately, from the aggregated secondary results available from the metanalysis and systematic reviews, it is not possible to provide a precise and absolute indication for the STA vs. ELA.

Reduction quality with STA is generally reported to be good by most of the authors, but in our opinion, the most challenging fractures are the comminuted Sanders type III. For type IV, in fact, one can be satisfied with restoring an acceptable shape and size even without expecting anatomical joint reduction, for which, in any case, sooner or later, arthrodesis has to be considered.

4.4. Arthroscopy

ARIF has experienced good results in diagnosis but lacks any statistically significant difference in outcomes when compared to other treatments. This procedure of increasing diagnostic importance in the future could improve the quality of the obtainable reduction and, therefore, the healing of the fracture [35,36,63].

4.5. 3D Printing

Three-dimensional printing is becoming an increasingly innovative and interesting solution [68–71]. “3D printing-assisted ELA surgery showed a better rate of excellent and good outcome, shorter operation time, less intraoperative blood loss, fewer intraoperative fluoroscopies and fewer overall complications. Besides, there is still a need for large- sample, high-quality, long-term randomized controlled trials to confirm this conclusion” [38].

4.6. ORIF vs. Arthrodesis

ORIF seems to provide better results when compared to subtalar arthrodesis in Sanders type II and type III fractures, while for type IV fractures, there is no statistical difference. ORIF is the most suitable treatment for less complex calcaneus fractures, while when anatomical reduction is impossible, subtalar arthrodesis has better results in terms of functionality and complications [36]. Primary arthrodesis for the treatment of Sanders type IV fractures has shown good results considering the severity of bone impairment; however, this treatment is rarely chosen as the first approach due to poor residual function. Its importance is, therefore, emphasized in a review when the degree of displacement is high [58,59].

4.7. Cannulated Screws vs. ORIF

Treatment with cannulated screws did not show a statistically significant difference compared to treatment with ORIF in terms of functional results. The treatment with cannulated screws, however, is thought to be superior in terms of surgical timing and quality of reduction [9,39].

4.8. Resorbable Metal Osteosynthesis

Resorbable metal osteosynthesis devices can also be a valid tool in certain cases, but unfortunately, none of the reviews on calcaneal fractures have specifically considered them [72].

4.9. Peroneal Tendons Instability

The instability of the peroneal tendons is often undiagnosed despite the fact that it is frequently associated with an increasing degree of calcaneal fracture and can compromise the stability of the hindfoot if not properly treated. As summarized in one of the articles, “The double-density sign on profile radiography and abnormal talar tilt in the distal talofibular joint are important signs that may indicate fibular tendon dislocation. Timing in surgical intervention is essential for satisfactory clinical outcome. Orthopedic surgeons should be aware of this uncommon injury to avoid misdiagnosis or inappropriate treatment” [53].

4.10. STA vs. MIS

In terms of functional results, STA can be considered a good option, whereas, in terms of complications arising in the skin, minimally invasive treatments are superior. Residual pain was reported to be not so different, while return to preinjury activity and work and shoe fitting were better with surgery. Moreover, the secondary subtalar fusion rate was lower with surgery. On the other hand, workers’ compensation affected the outcome, and none of the methods of fixation was revealed to be significantly superior [45].

4.11. Plates

In the cases of osteoporotic fractures, angular stability plates appear to demonstrate greater mechanical strength than non-locking devices [46,47].

4.12. ORIF vs. Percutaneous Treatment

By comparing various studies, it emerges that calcaneal fractures are treated more frequently with ORIF as the degree of complexity of the fracture increases. In the case of lower complexity fracture, percutaneous management is the best alternative in terms of complications and anatomical reduction. Many percutaneous fixation methods were reported, such as Schanz pins and Kirschner wires, cannulated screws, and arthroscopically assisted techniques, but the inconsistency of documentation and the lack of statistical significance do not allow for drawing definitive conclusions. However, percutaneous fixations were associated with a much lower complication rate than those with open procedures, regardless of the technique [50–52].

4.13. Intra-Operative Computed Tomography (CT) Scan

An improvement in the quality of the reduction could be obtained with the use of intra-operative CT scans, but at the expense of time, as well as biological (radiation) and economic costs.

4.14. Pedobarography

Pedobarography seems to be a promising tool to predict outcomes, but it should be more standardized. It could be useful in developing customized aids, such as insoles, aiming for a more individualized improvement [46].

4.15. Circular External Fixation

Using a circular external fixator for calcaneal fracture is a good option for high-degree displacement if the condition of the overlying tissues makes the fracture not surgically attackable. The results show a good reduction and recovery of function with low rates of complications, such as infection. So, we could consider external fixation a valid surgical alternative, but further high-level studies are needed [47].

4.16. Bone Grafts

The use of bone grafts is justified by the lack of spongy tissue that the compressive force of the trauma causes. In many studies, the AOFAS scores were higher than those with no bone graft, and similar Böhler's angle, Gissane's angle, calcaneal width, and calcaneal height were obtained. Moreover, no increased risk of postoperative complications was identified, and it seems that with bone grafts, full weight-bearing can be granted earlier without compromising outcomes in comparison to more conservative protocols. The use of bone grafts seems to improve outcomes in terms of fracture reduction, lower pain in the fracture site, and better restoration of function [15,49]. Although we know that bone auto- and allo-grafts are not exactly equal in mechanical and biochemical properties, in meta-analyses and systematic reviews, their results have been merged, providing overall conclusions. An innovative solution is represented by injectable bone substitutes with regenerative capacity [73,74].

4.17. Electromagnetic Fields

Electromagnetic fields have also demonstrated an encouraging role in bone consolidation and can, therefore, be considered a valid complement in the treatment of calcaneal fractures [75,76].

It is important to consider that a common drawback of clinical studies is the absence of uniformity in the outcomes and related evaluation tools in the literature. This constitutes a limitation to the ability to adequately compare the various case series. Furthermore, even if AOFAS is the most used outcome score and appears to be the most widely accepted scoring system for calcaneal fractures, [77] it could not be an optimal tool in this specific field. The same can be true for patient-reported outcomes measurement information systems (PROMIS).

We must recognize that, among the limitations of the study, part of the 888 articles analyzed in the 59 meta-analyses and/or systematic reviews selected are repeated two or more times, but this is not particularly relevant as the data are not "weighted" based on the number of papers in the which are reported.

5. Conclusions

The management of calcaneal fractures is still controversial. The traumatic nature of the injury and the importance of this bone in supporting the load in the standing position and gait make its treatment and healing important. A correct and precise diagnostic pathway is crucial for optimal treatment and should include an accurate and specific acquisition of medical history, a careful physical examination, including soft tissue assessment, and a precise classification of the fracture based on targeted radiographic and CT scan examinations. (Figure 3). Only after a personalized and accurate evaluation the most appropriate therapeutic path can be undertaken for that specific patient.

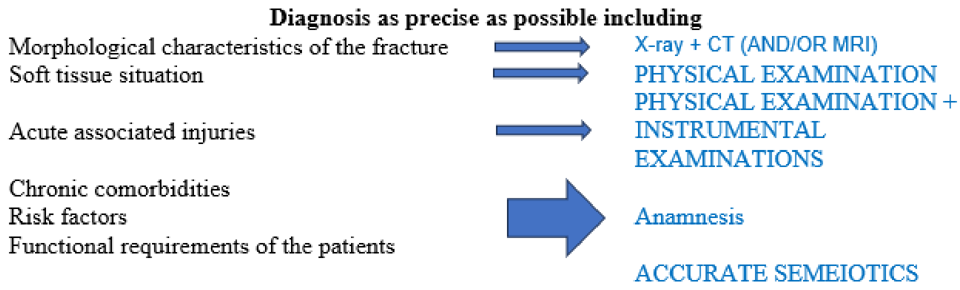

Figure 3. Optimizing diagnosis and treatment of calcaneal fractures.

From this review of the secondary literature about calcaneal fracture management, it emerges that the optimal treatment should be studied and individualized according to the patient, his/her functional requirements, and the type of fracture. New emerging technologies and new studies appear to offer important therapeutic and diagnostic alternatives, but further investigations are necessary to determine their validity.

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