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*Original Article*

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## THE VALUE OF TIBIOASTRAGALAR ARTHRODESIS FOR POSTTRAUMATIC ANKLE ARTHROSIS

Nicolae GORUN<sup>1</sup>, Ștefan ANDREI<sup>1</sup>

1) Department of Orthopedy, "Sfântul Ioan" Emergency Hospital, Bucharest

### Abstract

The aim of this study is to demonstrate the value of tibioastragalar arthrodesis as a treatment for arthroses after malleolar fractures, tibial pillar fractures and astragalar fractures.

It is discussed arthroses that appeared after malleolar fractures: neglected, incorrectly treated, without any follow up, complicated (suppuration, vicious callus).

The study includes 90 arthroses: 38 cases (42.2%) with external transperoneal arthrodesis (Adams-Crawford technique); 42 cases (46.4%) with anterior arthrodesis (Watson-Jones technique); 10 cases (11.4%) with anterior arthrodesis (R. Méary technique).

The results were very good and good in 84 cases (93.3%) and unsatisfactory in 6 cases (6.7%). In most cases of posttraumatic painful tibioastragalar arthrosis, arthrodesis' results are good and very good. For this reason we recommend it fully convinced.

**Keywords:** ankle fractures, arthrosis, arthrodesis, external path, anterior path

### Rezumat

Obiectivul acestui studiu este de a demonstra valoarea artrodezei tibioastragalare, în tratamentul artrozelor după fracturi maleolare, tibiale și astragalare.

Sunt descrise artrozile care apar după fracturile maleolare neregulate, incorect tratate sau complicate cu supurații și calus vicios.

Studiul este realizat pe 90 de cazuri de artroze: 38 (42,2%) cu artrodeză transperoneală (tehnica Adams-Crawford), 42 cazuri (46,4%) cu artrodeză anterioară (tehnica Watson-Jones) și 10 cazuri (11,4%) cu artrodeză anterioară (tehnica R. Méary).

Rezultatele au fost foarte bune și bune în 84 cazuri (93,3%) și nesatisfăcătoare în 6 cazuri (6, 7%). În majoritatea cazurilor de artroză tibioastragală dureroasă

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<sup>1</sup> **Address for correspondence:** professor Gorun Nicolae, Department of Orthopedy, "Sfântul Ioan" Emergency Hospital, Bucharest, e-mail: nicolaegorun35@yahoo.com

*posttraumatică, artrodeza are rezultate bune, motiv pentru care o recomandăm în practică.*

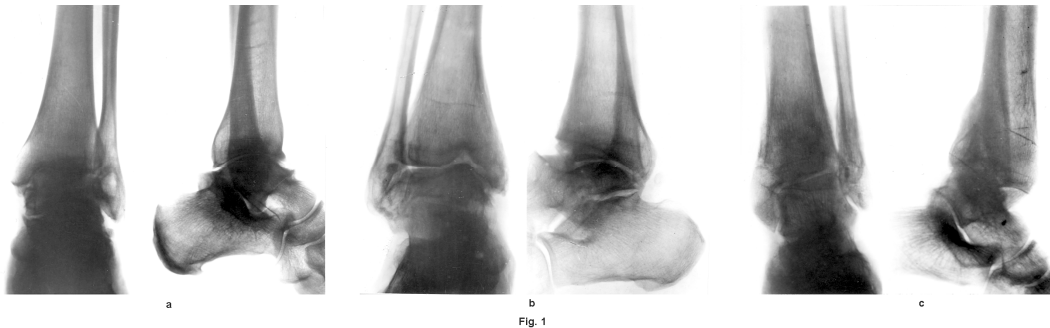
**Cuvinte-cheie:** *fracturi angulare, artroză, artrodeză, plastie anterioară, plastie externă*

We refer only to arthritis installed after neglected, incorrectly treated, or complicated maleolar fractures. These complications are not rare. They require a rigorous, well marked treatment in order to avoid questionable results or failures. The scope is demonstrating the value of tibioastragalar arthrodesis in arthrosis performed after maleolar and tibial pillar fractures.

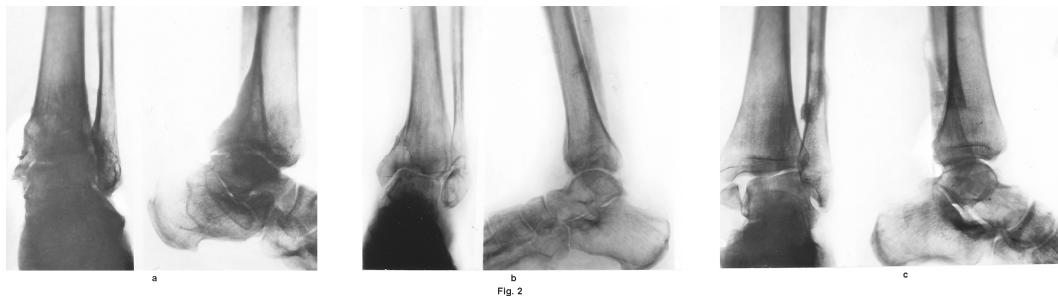
The tibioastragalar arthrosis' etiopathogenesis has local and regional causes. As local causes there are the mechanical, static and trophic factor (1, 2) .

The pathogenic mechanism is intricate and complex and is based on vicious circles. Joint incongruity and misalignment lead to uneven loading of joint surfaces resulting in localized condral wear and subcondral sclerosis. Other mechanisms are disruption of local blood circulation leading to sclerosis of periarticular soft tissues (3).

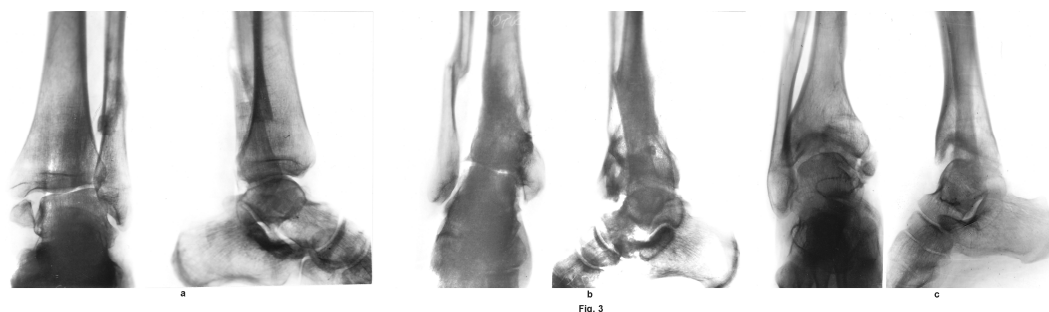
As regional causes there are vicious consolidated leg fracture leading to ankle misalignment. Subastragalar and / or mediotarsal arthrodesis leads to tibioastragalar joint overloading, especially when the technique was not perfect. (Figure no. 1, 2, 3, 4).



**Figure 1**



**Figure 2**

**Figure 3****Figure 1-4:** Some types of tibiocalcaneal arthrosis evocative for initial fracture mechanism (figure 4 shows some serious types of tibiocalcaneal arthrosis).

Tibiocalcaneal arthrosis' characteristics are: it has a predominant traumatic origin, it is very common in young, most often it installs after vicious callus, more rarely after fractures without displacement or fully reduced fractures or after surgically treated fractures, it is rapidly evolving and irreversible, it leads to functional disability, it greatly benefits from arthrodesis that offers the comfort of a stable and painless ankle, but for the cost of a definitive joint jam, well tolerated (1, 2).

We carried 90 arthrodeses: external transperoneal arthrodesis, Adams-Crawford technique in 38 cases (42.2%), anterior arthrodesis, Watson-Jones technique in 42 cases (46.4%) and anterior arthrodesis (R. Méary technique) in 10 cases (11.4%).

Some steps of surgical technique: Adams-Crawford technique consists in fibular osteotomy 7-8 cm above the external malleolar peak, then top to bottom release of the resected fragment followed by flipping and preparing of the internal face of the fragment, including resection of the astragalar joint surface (4, 5).

Next we perform a resection of the external tibial cortical surface and external astragalar surface, a horizontally tibiocalcaneal joint resection. We lower the peroneal fragment on the external astragalar face followed by a 3-4 screws fragment fixation to the tibia and astragalus.

Peroneal graft has a dual role as an immobilization splint and an autograft.

Because of the following risks some authors not recommend this method: valgus misalignment, unstable mounting metal, secondary skin necrosis, graft fracture, slowly consolidation (Figure no. 5, 6, 7).

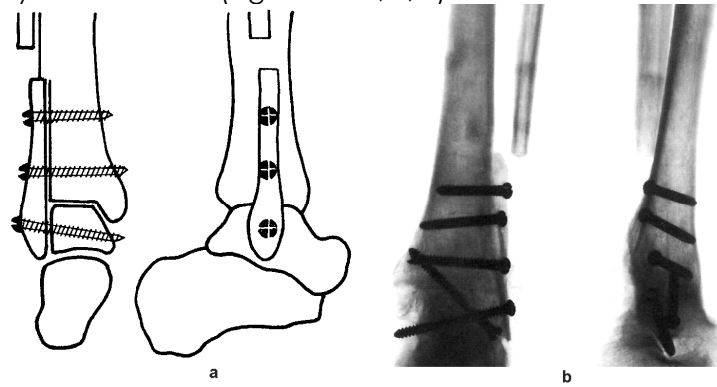


Fig. 5

**Figure 5:** Adams-Crawford technique (postoperative appearance).

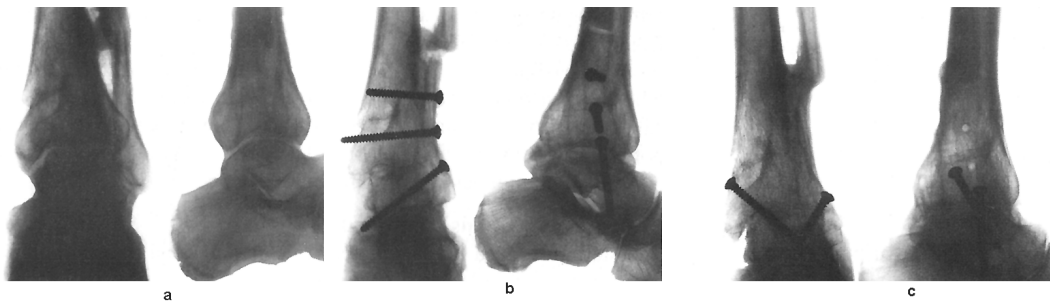


Fig. 6

**Figure 6:** The previous case after a valgus diversion of the foot (a); after reversal and correction (b); after consolidation (c).

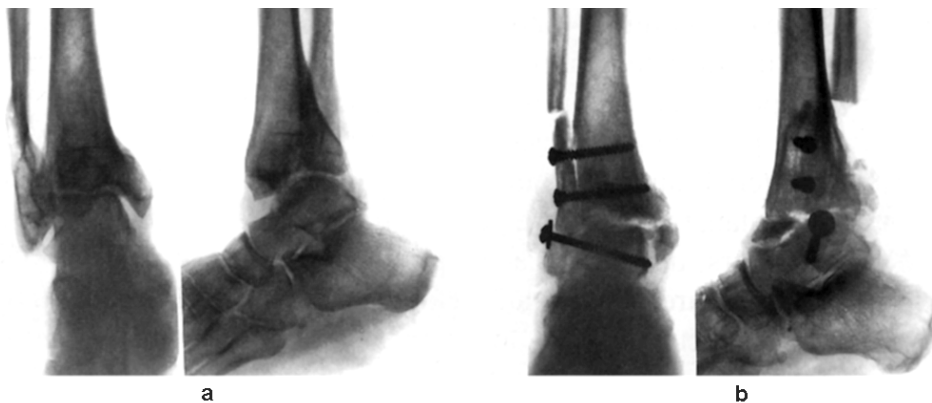
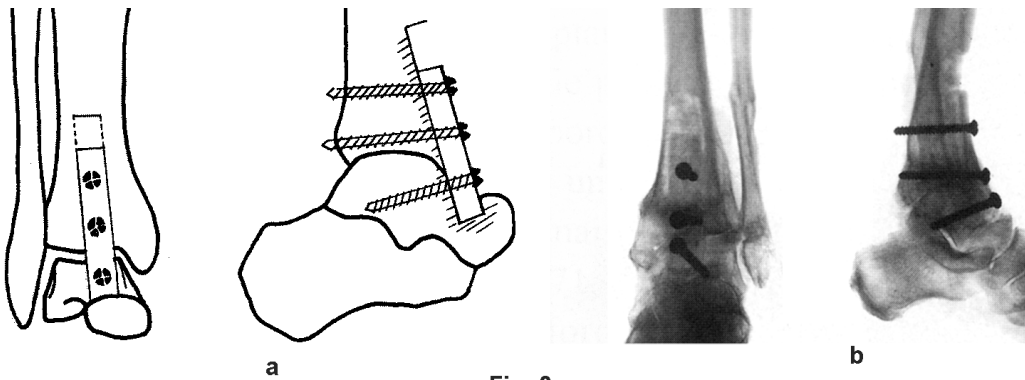


Fig. 7

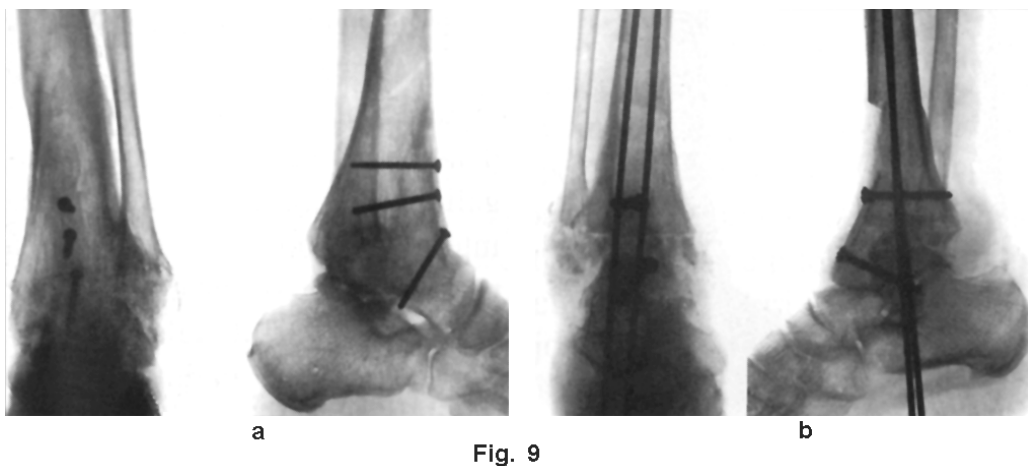
**Figure 7.** Tibioastragalar arthrosis after a trimalleolar fracture - postoperative radiological appearance (a); the radiological appearance of the same case - a failure of the Adams-Crawford technique (b).

The Watson-Jones technique uses the anterior median approach. We release the anterior face of the tibia in distal third. We cut a 7-8 cm long rectangular graft of the anterior tibial surface. We perform a horizontally tibioastragalar joint resection. We create a notch in the astragalus (body) followed by the graft deployment, lowering and forced flushing in astragalus and a 3-4 screws fixation to tibia and astragalus (5, 6).

We have to emphasize that: a too deep notch in astragalus can lead to an exaggerated echinata; we can associate transplantar wires to the screws fixation; the bone defect remaining after lowering the tibial graft will fill spontaneously; this method lead to a faster consolidation (Figure no. 8, 9, 10).



**Figure 8.** Watson-Jones techniques (a); postoperative appearance - the tibial graft slipped, fixed with three screws (b).



**Figure 9.** Postoperative radiological appearance in a case operated by Watson-Jones technique (a); postoperative radiological appearance in a case in which the fixation was done with 2 screws and 2 transplantar wires (b).



Fig. 10

**Figure 10.** Aligned tibiostagal arthrosis - preoperative radiological appearance (**left side**); postoperative radiological appearance of the same case - the 3 screws fixation and filling of the bone defect (**right side**).

Méary technique uses an anterior approach, intertibioperoneal, starting 7-8 cm above tibiostagal line, descends into intertibioperoneal depression and ends on the external leg, 1 cm under and 2 cm anterior of peoneal malleolus (attention: external branches of musculocutaneous nerve) (7). We release the anterior tibial pillar face and upper astragalus face. We perform a horizontal flat section perpendicular to the axis of the tibia, in the subcondral layer, which involves only  $\frac{3}{4}$  anterior pillar (avoid damaging retrotibial items). We carry a flat and horizontal resection of the astragalus dome with external or internal wedge, depending on deformity; if an arrow-headed resection with a greater wedge is required recourse to a balanced tibial pillar resection (8). We finish with the alignment and metal fixing using 2 crossed screws: first screw obliquely oriented from top to bottom and from outside to inside, from tibia into astragalus, the second screw bottom up and outside in oriented, from astragalus into tibia (Figure no.11).

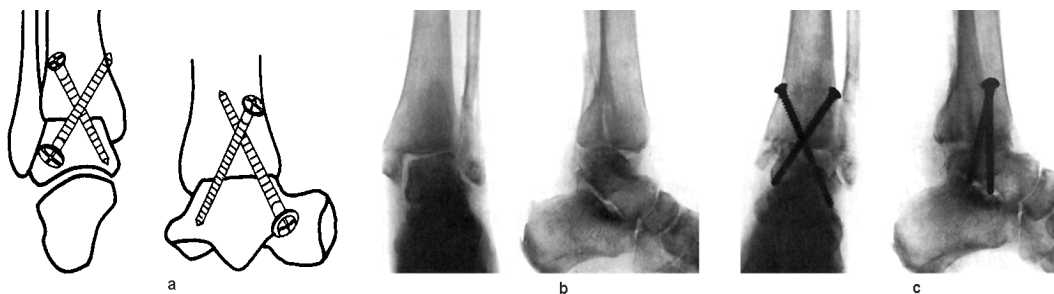


Fig. 11

**Figure 11.** Méary technique (**a**); preoperative radiological appearance in an unbalanced arthrosis (**b**); postoperative radiological appearance (**c**).

We have to emphasize that: the placing screws direction can be changed; when a big risk of astragalar necrosis is present, the Adams-Crawford technique may be associated leading to consolidation difficulties; in the case of tibioastragalar arthritis with subastragalar arthritis will be also associated a subastragalar arthrodesis (9, 10) (Figure no. 12, 13, 14).

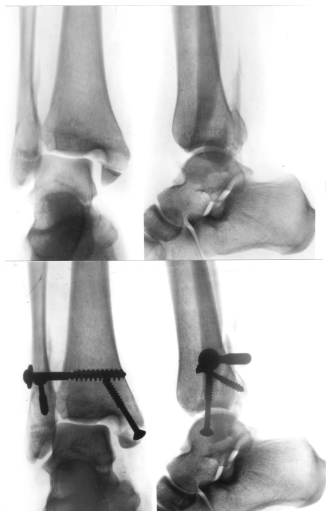


Fig. 12

**Figure 12.** Preoperative and immediate postoperative appearance. We notice incorrect reduction and inconsistent metal fixation.



Fig. 13

**Figure 13.** The same case three months after surgery, while the diastasis screw was removed. The two remaining malleolar screws (**above**), severe arthrosis after extracting screws (**below**).



Fig. 14

**Figure 14.** Same case, postoperative radiological appearance (**above**). It is noted a 3 screws and 2 transplatar wires fixation; same case, the radiological appearance after consolidation after wires' extraction (**below**).

We also performed some additional surgical gestures: a subastragalar arthrodesis in 2 cases, one or both malleoli resection using them as grafts in 27 cases and a malleolar osteotomy and their application on the lateral astragalar faces in 11 cases.

We obtained very good and good results in 84 cases (93.3%) and unsatisfactory results in 6 cases (6.7%) from which we repeated arthrodesis in 4 cases and we performed a subastragalar arthrodesis with alignment in 2 cases.

## Conclusion

Ankle fractures (maleolar and tibial pillar) are encountered very often in nowadays life (traffic accidents, work accidents, sports or domestic accidents).

In order to avoid a posttraumatic arthrosis, a correct treatment of these fractures is necessary.

Tibioastragalar arthrosis has a predominant posttraumatic origin. It has a rapidly irreversible evolution and it occurs frequently in young.

Performing a tibioastragalar arthrodesis we achieve a stably painless ankle but for the cost of a definitive joint jam, well tolerated.

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