

# ASYMPTOMATIC TARSAAL COALITIONS

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## INTRODUCTION

Tarsal coalitions are a well known clinical entity to the podiatric physician. Numerous articles have been published dealing with this topic, classification schemes have been proposed, procedures of choice suggested, and many theories proposed suggesting a myriad of etiologies. Few clinicians would deny that the presence of a significant collapsing pes valgo planus deformity in conjunction with a tarsal coalition generally produces significant disability and symptomatology.

The terminology "peroneal spastic flatfoot" is frequently used, and implies the presence of spasm of the peroneal musculature, a painful flatfoot deformity, and a tarsal coalition. It has been the author's experience that the degree of flatfootedness is often proportional to the extent and severity of the symptoms. The more severe the flatfoot deformity, the greater the symptomatology, regardless of the joint involved in the coalition and whether it is a syndesmosis, synchondrosis or synostosis. Most practitioners would agree that a rectus foot, even with an underlying tarsal coalition, is less likely to produce significant symptomatology than the same tarsal coalition in a patient with a pes valgo planus deformity. Articles have been written debating the controversy of which came first: the peroneal spasm or the painful flatfoot condition. Once again, the "chicken or egg" question arises. Regardless of which arises first, there seems to be a clear relationship between the two. Peroneal spasm is unlikely to be present in a foot with a rectus alignment; a severe flatfoot with a tarsal coalition commonly has some degree of peroneal spasm.

Over the years, the author has had the opportunity to examine numerous patients with

symptomatic and asymptomatic (or minimally symptomatic) tarsal coalitions. It is this clinical experience that has led the author to carefully re-evaluate and reassess the implications of the position of fusion in the rearfoot. The author has had the opportunity to treat patients with minimal to no symptomatology, but with a tarsal coalition involving the subtalar joint, talonavicular joint, or calcaneonavicular joint. In each case, the foot was in a relatively rectus alignment based on standard radiographic parameters, such as the calcaneal inclination angle, talocalcaneal angle, talonavicular congruity, cuboid abduction, talar declination, medial column faulting, and forefoot supinatus or varus. In most cases, the overall alignment of the foot was found to be rectus with minimal to no pronation. In addition, most cases demonstrated a nearly complete synostosis configuration to the coalition itself and also presented later in life (i.e., after 20-25 years of age). The tarsal coalitions themselves were readily identifiable on conventional x-rays and, in some cases, specialized studies such as a CT scan. In some cases, the patients presented with another complaint (not necessarily unrelated to the tarsal coalition), but the tarsal coalition was found to be incidental.

Patients with the combination of a rectus foot with an underlying tarsal coalition usually present with only minor complaints such as non-specific soreness or stiffness in the foot. It is not uncommon for such individuals to have reported a recent increase in activity such as volleyball, basketball or a similar sport requiring increased amounts of weight bearing, ambulation, and/or running or jumping. In these cases, the pain is not attributable to the overall architectural configuration of the foot, which is generally normal. The symptoms are not significantly different in a

patient with nonspecific degenerative arthritis without a coalition. Some patients seek professional opinions merely out of inquisitiveness and curiosity and not so much for the purpose of seeking surgical intervention or definitive treatment. Experience with multiple cases of asymptomatic tarsal coalitions lends convincing evidence that perhaps the pain and disability of many patients with tarsal coalitions is not, in fact, the coalition itself, but rather the severe malalignment of the foot and the distortion of normal architecture. A foot which is then subject to peroneal spasm, in an attempt to restrict motion, acts potentially as a very destructive force and worsens the situation. In cases where a synostosis has not yet formed, such a spasm could conceivably contribute to a further deterioration of foot alignment and function before the coalition progresses on to a complete synostosis.

### **SUGGESTED PROTOCOL FOR EVALUATION**

The proper conservative or surgical management of any tarsal coalition should be based upon a combination of both the clinical and radiographic findings. Emphasis should not initially be placed on radiographic evaluation or other specialized studies. Emphasis, however, should be placed on the complete history of the chief complaint in an attempt to elicit and determine whether the symptoms reported are attributable to and consistent with a pes valgo planus deformity, or whether the symptoms are related to degenerative arthritic changes or the lack of motion.

A mere complaint of stiffness within the foot secondary to a coalition may not necessarily be responsive to any surgical intervention. Likewise, a patient with significant medial longitudinal arch discomfort, peroneal spasm, and a severe pes valgo planus deformity in conjunction with a tarsal coalition (e.g., calcaneonavicular bar) may not be responsive to resection of the coalition alone. Less commonly, a patient will present with typical symptoms of a high arched foot with a concomitant calcaneonavicular coalition and, again, would be unresponsive to surgical resection of the bar alone. In such cases, symptoms may be attributable to the lack of motion alone.

A complete lower extremity examination, with emphasis on the pedal assessment, is the

next step in the evaluation process. The overall alignment of the lower extremities should be assessed and the symptomatic side compared to the contralateral limb. Special attention should be paid to subtle but distinct differences between the two extremities, and this information correlated with the subjective information. Detailed assessment of the range of motion of the ankle, subtalar, and midtarsal joints is of critical importance.

Muscle function should be assessed and any appreciable increase in tone or muscle spasm noted. The peroneus brevis is the most likely muscle to be found in spasm, followed by the extensor digitorum longus and, less frequently, the peroneus longus. The presence of muscle spasm suggests a symptomatic flatfoot deformity. It is unlikely that one will encounter significant muscle spasm in a patient with a rectus alignment of the foot, even in the presence of a tarsal coalition. Finally, all patients should be observed in their relaxed stance position and ambulating for several minutes. The line of progression of the affected extremity provides useful information in terms of the goals of surgical correction should it become necessary.

### **Radiographic Evaluation**

Radiographic evaluation should consist of dorso-plantar, lateral, and medial oblique films taken in angle and base of gait position. Contralateral films are generally recommended for comparison purposes. In addition to the identification and recognition of an actual tarsal coalition, the alignment and position of the subtalar and midtarsal joint complexes should be assessed and compared. Evidence of severe pronation in the rearfoot and midfoot suggests the need for more than simple resection of the coalition, which is what is commonly recommended. An anterior-posterior and mortise view of the ankle are also recommended. These views should also be obtained to rule out a "ball-and-socket" deformity or other coexistent osseous deformity. In addition, ankle x-rays serve as a baseline for comparative purposes in the future, especially if a major fusion is to be performed.

It has been suggested and implied repeatedly in the literature that a major fusion such as a triple arthrodesis is likely to result in the formation of a ball-and-socket ankle joint over an extended period of time. Interestingly, the author

has noted no such cases having been reported in the medical literature in which preoperative x-rays demonstrated a normal configuration of the ankle joint, and subsequent x-rays after the fusion clearly demonstrated the formation of a ball-and-socket ankle joint. While it is certainly conceivable that such deformity could develop, its occurrence is extremely rare and unlikely.

There have been no long-term retrospective studies to show that the ball-and-socket ankle joint occurred with any statistical significance in patients having undergone a rearfoot or midfoot fusion procedure. The author believes that this is simply another "podiatric myth" which has partially developed because of the identification and recognition of the ball-and-socket ankle joint in some patients with tarsal coalitions. This has been noted in the medical literature. It clearly does not occur with any predictable frequency. Its presence, along with a tarsal coalition, would suggest some type of abnormal osseous syndrome or complex.

In some cases, further evaluation may require a CT scan or MRI. This is particularly true of coalitions involving the subtalar joint which are of a syndesmosis or synchondrosis type. On rare occasions, a bone scan may also prove beneficial. Most coalitions, however, can be identified on conventional x-rays, and these, when coupled with the clinical evaluation, are sufficient to establish the diagnosis of a tarsal coalition. Coalitions presenting in later life should already be of the synostosis type and, therefore, readily identifiable on conventional x-rays. CT scans and MRI add little additional information in such cases.

### **IMPLICATIONS FOR SURGERY**

Over the years, numerous recommendations have been made regarding the surgical management of a tarsal coalition. Perhaps the most extensive and useful classification is the one advocated and described by Downey in 1990. This classification scheme takes into consideration the type of coalition, the patient's age, and the presence or absence of secondary changes.

It is very important that the etiology of the patient's symptoms be recognized and identified. While many cases may not have a clear-cut etiology, one should determine whether it is the presence of the flatfoot deformity causing the majority

of symptoms, or whether it is the tarsal coalition. As previously discussed, resection of a tarsal coalition with an uncorrected severe pes valgo planus deformity is likely to demonstrate persistent symptoms attributable to the flatfoot deformity. If, after resection of the bar, sufficient flexibility is achieved and the foot can be controlled with an appropriate orthotic device, then the long-term outcome is improved. In cases in which restoration of a controllable and flexible foot cannot be achieved, an additional procedure should be considered to restore and maintain a more normal architectural alignment of the foot. It is not uncommon for patients who have simple resection of the coalition, in the presence of a persistent flatfoot deformity, to later require additional surgery of an arthrodesis type to correct the malalignment. Perhaps resection of the bar, in conjunction with correction of the flatfoot deformity, would decrease the necessity and frequency of triple arthrodesis or other major rearfoot fusions in the ensuing years.

The ancillary procedure(s) performed in conjunction with the coalition resection will depend upon a number of factors, of which the most important may be the planal dominance of the deformity. Potential procedures would include a tendo Achillis lengthening or gastrocnemius recession, subtalar joint arthroereisis or arthrodesis, midtarsal joint stabilization procedures such as a talonavicular arthrodesis or Evans calcaneal osteotomy, or other medial arch osseous or soft tissue procedures.

In patients with tarsal coalitions in whom a rectus alignment or mildly cavus foot is present, resection of the coalition alone is also unlikely to prove beneficial. In most cases, these patients can be controlled by conservative treatment modalities and do not require surgical intervention. When surgical intervention is necessary, arthrodesis of one, two or three joints will most likely be the procedure of choice.

Finally, the differences in clinical symptomatology between individuals with a pes valgo planus deformity versus a rectus foot alignment, in the presence of tarsal coalitions, have implications with regard to the position of fusion when performing any major rearfoot arthrodesis. It is universally accepted that when performing a major rearfoot fusion, "thou shalt not varus". Some controversy, however, exists over the

recommended position of fusion, with most recommending that the foot be fused in a position of pronation (i.e., frontal plane valgus and transverse plane abduction). The author's experience over the last nine years is that neutral position is perhaps the optimal position of fusion, and is the one least likely to result in clinical symptomatology in the foot, ankle, knee or hip. The author has

found it extremely helpful to assess the proper position desired by taking preoperative dorso-plantar and lateral x-rays with the foot placed in the corrected (neutral) position. These x-rays have been used as an intraoperative reference to confirm proper alignment and position at the time of fusion.

### RADIOGRAPHIC REVIEW



**Figure 1A.** Multiple coalitions involving the cuneiforms and cuboid bone, as well as a metatarsus adductus deformity.



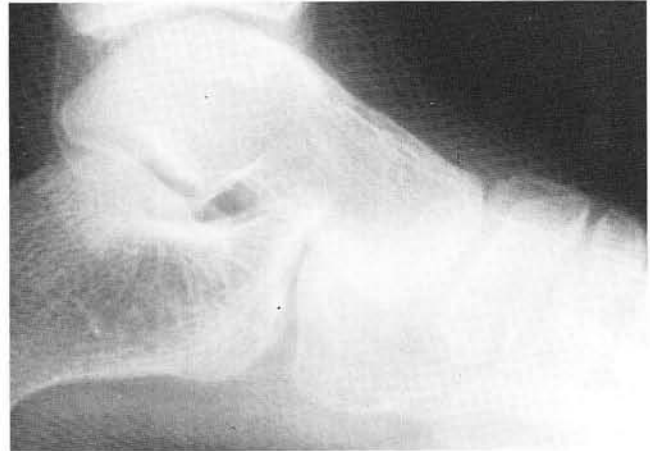
**Figure 2B.** A ball-and-socket ankle joint is also present.



**Figure 2A.** Tarsal coalition involving the talonavicular joint. Note the conspicuous absence of the fifth ray.



**Figure 3A.** Talonavicular coalition of a synostosis type in a young child with open epiphyses. The relatively rectus alignment of the foot would suggest that symptomatology is likely to develop later in life and, assuming that the foot maintains its relatively rectus alignment, will be due to degenerative arthritic changes.



**Figure 3B.** Lateral view of the talonavicular synostosis.



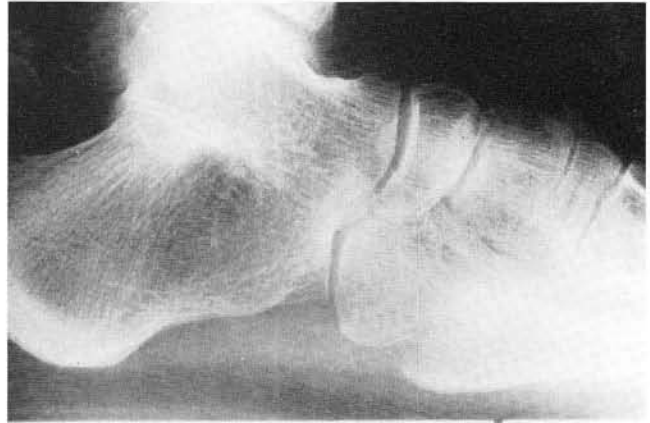
**Figure 4A.** Radiographic presentation of an adult patient with a previously undiagnosed subtalar joint coalition, confirmed with CT scans, involving the posterior and middle facets.



**Figure 4B.** Lateral view of the subtalar coalition. Note the overall rectus alignment of the foot, and the minimal secondary arthritic changes present. There was no significant pronation of the subtalar or midtarsal joint complexes, and no ball-and-socket ankle joint was present.



**Figure 5A.** Complete subtalar joint coalition involving the posterior, middle, and anterior facets in an otherwise asymptomatic foot.



**Figure 5B.** Lateral view of the subtalar coalition. Note the overall rectus alignment of the foot and the absence of any secondary arthritic changes.



**Figure 6A.** Weight bearing x-rays of a patient with a calcaneonavicular bar and pes cavus deformity.



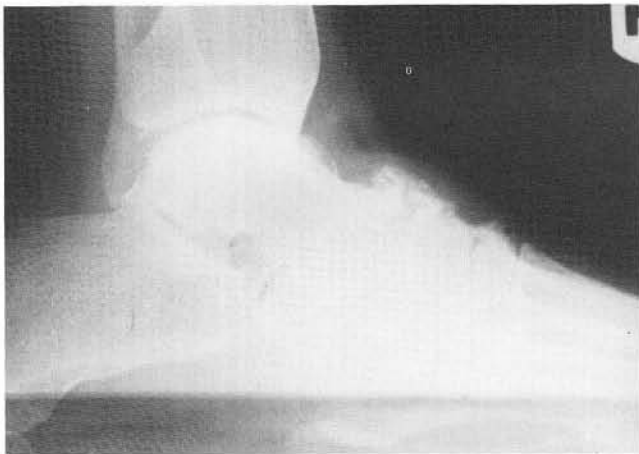
**Figure 6B.** Note the absence of any secondary degenerative arthritic changes.



**Figure 6C.** The synostosis is readily identified on the standard lateral oblique films.



**Figure 7A.** A 50 year old patient presenting with arthritic pain in the midfoot involving the naviculocuneiform articulation. Note the presence of a previously undiagnosed talonavicular coalition in both feet.



**Figure 7B.** Lateral view of the talonavicular coalition. No prior treatment had been rendered. Symptoms were attributed to the degenerative arthritis of the intertarsal joints and the limited movement of the subtalar joints.



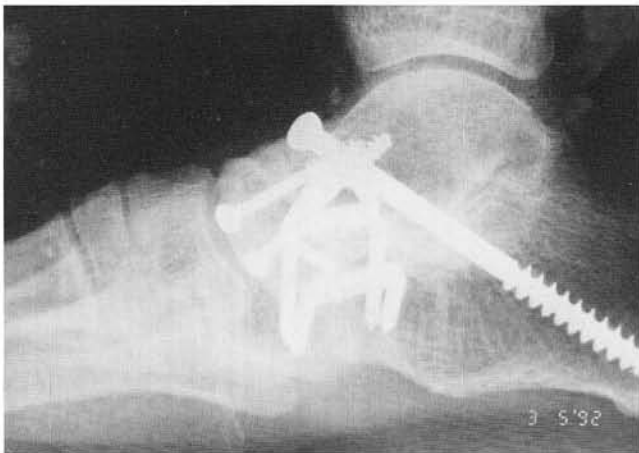
**Figure 8A.** Significant post traumatic arthritis involving the talonavicular joint. The patient was 45 years of age and sustained the original injury in childhood. Minimal symptomatology was present. The overall rectus alignment of the foot may be a contributing factor in keeping symptoms minimal in spite of this patient's very active involvement in running and athletics.



**Figure 8B.** Note the normal alignment and positioning of the contralateral foot.



**Figure 9A.** Symptomatic tarsal coalition of the subtalar joint in a patient who was complaining of pain and stiffness as well as moderate muscle spasms. Note the relatively good alignment of the foot in this patient.



**Figure 9B.** Definitive treatment involved triple arthrodesis. Minimal change in alignment was necessary to accomplish an excellent result.

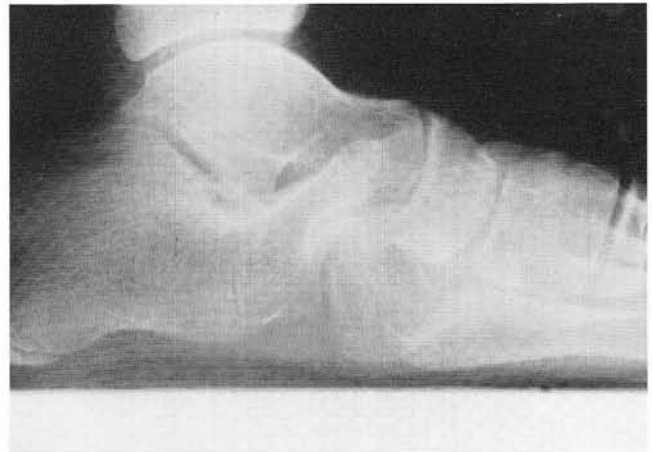


**Figure 9C.** The normal forefoot to rearfoot alignment was maintained with the fusion.





**Figure 10A.** Preoperative dorsoplantar x-ray of a patient with a calcaneonavicular coalition presenting in adolescence. A significant degree of pes planus deformity was present, along with peroneal muscle spasm.



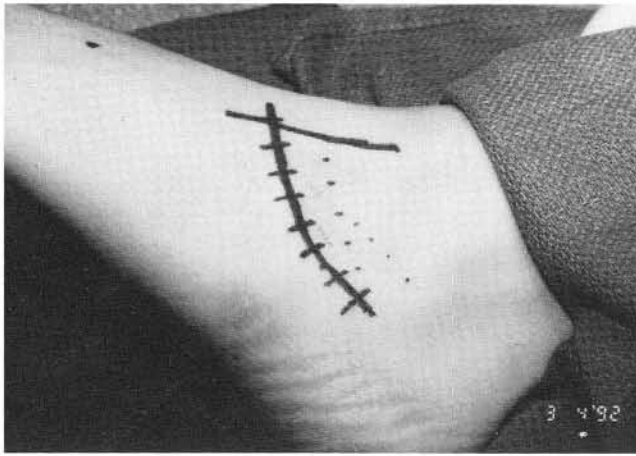
**Figure 10B.** Preoperative lateral x-ray demonstrating the calcaneonavicular synostosis. Definitive treatment was resection of the calcaneonavicular synostosis with subtalar joint arthrodesis to correct for the flatfoot deformity.



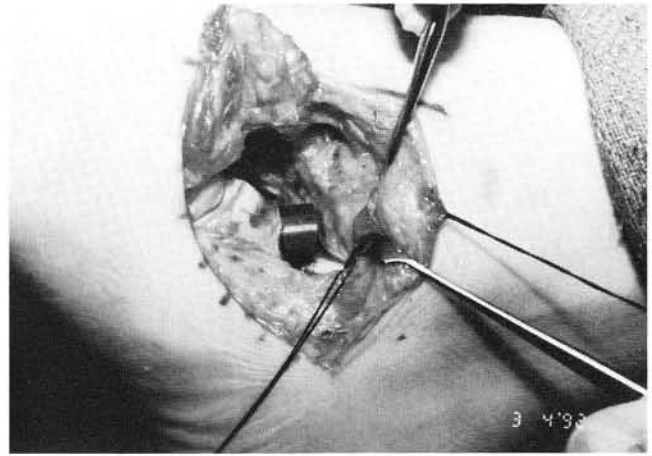
**Figure 10C.** Postoperative x-rays following resection of the calcaneonavicular synostosis and subtalar joint arthrodesis. Note the excellent restoration of alignment to the subtalar and mid-tarsal joint complexes.



**Figure 10D.** A significant decrease in the forefoot supinatus deformity is noted along with the spontaneous reduction of the medial column faulting.



**Figure 11A.** Recommended incisional approach for resection of a calcaneonavicular coalition, in conjunction with a subtalar joint arthroereisis for correction of a flatfoot deformity.



**Figure 11B.** Note the incision provides excellent exposure of the coalition site itself as well as the sinus tarsi and subtalar joint for proper insertion of an arthroereisis device. Shown is a STA-peg device.

### SUMMARY

The purpose of this presentation is to heighten the podiatric physician's awareness of the relationship between tarsal coalitions and the overall alignment and position of the foot with respect to symptomatology. A series of cases is presented demonstrating this intricate relationship and surgical implications. The author suggests that in cases of severe pes valgo planus, resection of the tarsal coalition in addition to correction of the flatfoot deformity may yield a better long-term result with less symptomatology. Resection of a tarsal coalition with uncorrected pes valgo planus is likely to result in persistent symptoms which will necessitate further surgical intervention in later years.

In addition, it is suggested that the optimum position of fusion in any patient undergoing a major rearfoot arthrodesis should be as close to a neutral position as possible. In some patients, slight pronation (abduction and eversion) may be more optimal, depending on a number of other factors.

### BIBLIOGRAPHY

Downey MS: Tarsal coalition: Current clinical aspects with introductions of a surgical aspects with introduction of a surgical classification. In McGlamry ED (ed) *Reconstructive Surgery of the Ankle and Leg: Update '89* Tucker, Ga., Podiatry Institute Publishing, 1989, p. 60.