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Case Reports and Series

Müller-Weiss Disease: Three- to Eight-Year Follow-Up Outcomes of Isolated Talonavicular Arthrodesis

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ABSTRACT

Numerous surgical techniques for the treatment of Müller-Weiss disease (MWD) have been reported. However, no extensive clinical and radiographic studies of isolated talonavicular arthrodesis and MWD have been reported. The present retrospective cohort study examined the outcomes of isolated talonavicular arthrodesis at 3 to 8 years of follow-up in 16 MWD patients with a collapsed longitudinal arch and at least Maceira stage III. Demographic data, pre- and postoperative visual analog scale (VAS) scores for pain on walking and walking disability, foot and ankle outcome scores (FAOSs), and radiographic parameters were analyzed, with statistical significance at $p < .05$. A survival analysis was used to determine the median time to union. The mean ± standard deviation pre- and postoperative VAS scores for pain on walking were 7.69 ± 1.62 and 2.19 ± 1.52 and the walking disability scores were 7.06 ± 2.11 and 2.31 ± 1.92, respectively. The pre- and postoperative FAOSs were 48.07 ± 21.50 and 82.27 ± 13.86 for activities of daily living, 30.86 ± 19.70 and 76.17 ± 22.39 for quality of life, and 20.93 ± 22.89 and 51.88 ± 23.66 for sports/recreation, respectively. The median pre- and postoperative FAOSs for the symptoms subscale were 73.22 (range 42.88 to 100.00) and 87.50 (35.71 to 100.00) and for pain were 34.72 (range 8.33 to 72.22) and 88.89 (54.41 to 100.00), respectively. Significant improvements occurred from preoperatively to postoperatively for VAS scores and FAOSs ($p < .05$). The mean pre- and postoperative calcaneal pitch angles were 11.31° ± 4.35° and 13.81° ± 5.60°, significant improvement ($p = .016$). Improvement was also seen midfoot abduction, with a mean pre- and postoperative anteroposterior Meary's angle of 14.38° ± 10.07° and 9.38° ± 12.21°. The survival analysis showed union was achieved in all patients, with a median time to union of 2 (95% confidence interval 1.03 to 3.00) months. Our data indicate that talonavicular arthrodesis provides satisfactory functional outcomes for MWD patients with a collapsed longitudinal arch.

Müller-Weiss disease (MWD) is an idiopathic foot condition whose pathology occurs at the navicular. It becomes fragmented on the lateral aspect, leading to an abnormal force across the midtarsal joint and causing progressive pain and deformity. The pain mostly occurs over the dorsomedial midfoot at the talonavicular joint. The common deformity is pes planovalgus. The radiographic characteristics of MWD are a comma-shaped or hourglass appearance, with an increase in the density of the navicular.

Varying hypotheses have been proposed to explain the pathogenesis of MWD, including primary osteonecrosis, osteochondritis, congenital malformation, arthritic changes over a dysplastic navicular, and infection. The disease mostly involves the lateral side of the navicular because of the limited blood supply in this area (1). The exact incidence of MWD is not known (2). It commonly presents in the fourth to sixth decades of life, predominantly among females (3).

Maceira classified the disease into the following 5 stages, according to the radiographic pattern: stage I, abnormal bone scan or magnetic resonance imaging findings of the navicular without deformity; stage II, minimal compression of the navicular found radiographically; stage III, a fragmented navicular with a low longitudinal arch; stage IV, increased fragmentation of the navicular, with a collapsed longitudinal arch; and stage V, complete navicular extrusion, with talo-cuneiform articulation (3).

The initial treatment of MWD is conservative and includes pain control, activity modification, and supportive and/or accommodative orthotics. If the pain worsens and interferes with daily activities despite full conservative treatment, surgical treatment should be considered (3).

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Numerous surgical treatments of MWD have been proposed, including internal fixation of the navicular, core decompression, and talonavicular, perinavicular, or triple arthrodeses. However, no consensus has been reached regarding the best option to provide satisfactory results with minimal complications (4–10). Another controversial issue is the role of the extension of the arthrodesis to the complex naviculocuneiform articulations (6,7). Coa et al (7) reported on perinavicular arthrodesis (talonavicular and naviculocuneiform joints), which showed good clinical and radiographic outcomes in those with Maceira stage III MWD. However, the study limitations included a small sample size (9 patients) and short, average follow-up period (22 months). The average time to union for perinavicular and triple arthrodeses in patients with MWD have been 3 and 5 months, respectively (6,7), quite long owing to the multiple joint arthrodesis. Isolated talonavicular arthrodesis for MWD was once reported as the surgical option that could provide satisfactory clinical outcomes in the case of normal subtalar and calcaneocuboid joints but the radiographic outcomes in terms of alignment of the foot and the average union time were not reported (9). To the best of our knowledge, no extensive study has been reported of the clinical and radiographic outcomes and survival analysis of isolated talonavicular arthrodesis in MWD.

Our objective was to provide the clinical and radiographic outcomes of talonavicular arthrodesis in MWD patients with a collapsed longitudinal arch (at least Maceira stage III) with 3 to 8 years of follow-up data available and to use a survival analysis to evaluate the median time to union.

Patients and Methods

The study was performed after receiving a certificate of ethics approval from our institution. A retrospective cohort study of MWD patients who had undergone isolated talonavicular arthrodesis was performed.

Three primary inclusion criteria were used. The first was a diagnosis of MWD of at least Maceira stage III, based on clinical observations (midfoot tenderness over the talonavicular joint with pes planovalgus deformity) and radiographs showing a comma-shaped/hourglass appearance or advanced fragmentation of the navicular and plantarflexion of the lateral talo-first metatarsal angle (Fig. 1). The second was patient age of ≥18 years. The final inclusion criterion was isolated talonavicular arthrodesis after failure of conservative treatment and a postoperative follow-up duration of >3 years. Conservative treatment was considered a failure if the patient had persistent pain and disability, experienced interference with their activities of daily living despite medication, and lifestyle adjustment and shoe modifications for ≥3 months had been unsuccessful. The exclusion criteria were incomplete clinical and radiographic data; associated hip, knee, and ankle disorders; neurologic diseases that interfered with walking; and associated osteomyelitis or chronic ulcers of the foot and/or ankle.

From 2005 to 2014, of 25 potential patients, 9 (36%) were excluded. Of the 9 patients, 1 (11.1%) had radiographic Maceira stage II and 8 (88.9%) had undergone talonavicular arthrodesis in association other surgical procedures. Thus, 16 patients matching the inclusion criteria were included in the present study. The reviewed demographic data included gender, affected foot, body mass index, underlying diseases, heavy smoking history (>20 pack-years), history of immunosuppression therapy, duration of symptoms, and preoperative parameters from weightbearing foot radiographs (i.e., calcaneal pitch angle, lateral Meary's angle, anteroposterior Meary's angle, and radiographic severity according to Maceira stage and naviculocuneiform arthritis).

The clinical evaluation included the preoperative and last follow-up visual analog scale (VAS) scores for pain on walking and walking disability (range 0 to 10) and the foot and ankle outcome scores (FAOSs) for the subscales of symptoms, pain, activities of daily living, quality of life (QoL), and sports/recreation (range 0 to 100). At the last follow-up visit, the foot parameters measured from postoperative radiographs (e.g., calcaneal pitch, lateral and anteroposterior Meary's angle, and naviculocuneiform arthritis) were recorded. The radiographic signs of naviculocuneiform arthritis were osteophyte formation or a joint space narrowing of <1 mm. Union was considered to have occurred with a clinical examination that showed no tenderness and motion over the joint that correlated with the presence of radiographic bone bridging across the surface of the arthrodesis of >50% on the anteroposterior and lateral radiographs (Fig. 2). The radiographic measurements were performed by 2 foot and ankle surgeons to measure inter- and intraobserver reliability.

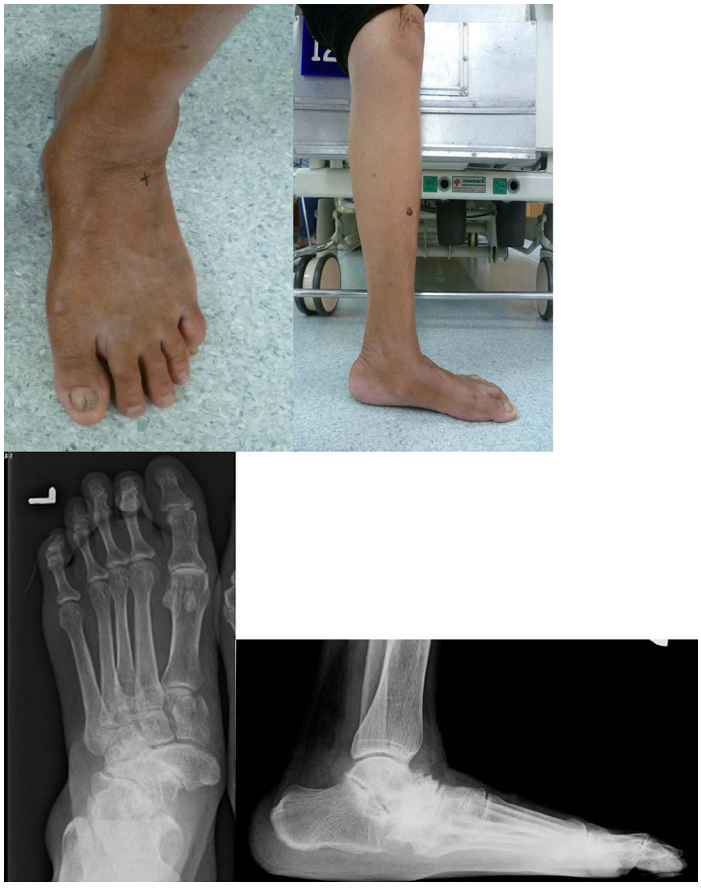

Fig. 1. Clinical appearance of patient with Müller-Weiss disease showing valgus deviation (abduction) of the midfoot and loss of the longitudinal arch (so-called pes planovalgus). The radiographs showed a comma shape with collapse of the lateral column of the tarsal navicular and plantarflexion of the talo-first metatarsal angle. The patient was classified as having Maceira stage ≥III.

The categorical data are presented as numbers, percentages, and ratios. The Shapiro-Wilk test was used to test the normality of the numerical variables. The numerical data are presented as the mean ± standard deviation for normal distributed data and the median and range for non-normal distributed data. The pre- and postoperative VAS scores for pain on walking and walking disability, FAOSs, and radiographs were analyzed using the paired *t* test and Wilcoxon signed rank test, with statistical significance at $p < .05$. A Kaplan-Meier curve survival analysis was used to evaluate the median time to union, with the corresponding 95% confidence intervals (CIs) for the procedure in question, setting union as the event of interest. The intraclass correlation coefficient and κ value were used to assess the inter- and intraobserver reliability of the radiographic measurements and the level