Arthroscopic Ankle Arthrodesis - Pitfalls and How to Make it Successful!

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ARTHROSCOPIC ANKLE ARTHRODESIS
I. HISTORY OF ANKLE ARTHRODESIS
A. Technique been present for many years
   1. More than 40 distinct techniques described
   2. Results are variable
   3. Potential complications exist, with incidences reported as high as 60%
B. Complications of arthrodesis
   1. Nonunion
   2. Delayed union
   3. Wound infection
   4. Pain
   5. Tibial fracture
   6. Hardware failure
   7. Unsightly scars
C. Incidence of pseudoarthrosis as high as 20-30% in the literature
D. Open ankle arthrodesis has many disadvantages
   1. Extensive surgical approach
   2. Significant tissue dissection
   3. High incidence of complications, including infection, nonunion, prolonged recovery and hospitalization
E. Historical dates
   1. First arthrodesis in late 19th century
   2. Morgan et al. described open fusion technique that maintained the bony contour of the ankle mortise; used two cross transmalleolar screws for internal fixation with a 96% successful fusion rate and excellent or good functional results in 98% of 101 fusions followed for an average of 10 years, 1985
   4. Morgan – first article on arthroscopic ankle arthrodesis, 1987
F. Biomechanics and biochemistry
   1. The ankle is relatively resistant to primary degenerative osteoarthritis
   2. Ankle cartilage properties prevent arthritis because of relatively better retention of tensile fracture stress and tensile stiffness with age (Kempson et al.)
   3. Ankle cartilage is metabolically different than knee cartilage
   4. Ankle cartilage is less effected by metabolic cytokine interleukin 1 (1L-1) and deleterious collagenases that are produced in response to 1L-1
II. INDICATIONS FOR ARTHROSCOPIC ANKLE ARTHRODESIS
A. Significant unrelenting pain at the tibiotalar joint which does not respond to conservative measures
B. Etiology of pain can include:
   1. Traumatic arthritis
   2. Hemophilic arthropathy
   3. Congenital deformity
   4. Rheumatoid arthritis
   5. Old osteochondral lesions
   6. Previous ankle infection

III. CONTRAINDICATIONS
A. Varus or valgus malalignment greater than 25 degrees (?)
B. Angulation less than 25° that is not correctable
C. Significant bone loss
D. Active infection
E. Previous failed fusion
F. Complex regional pain syndrome
G. Neuropathic destructive process in the ankle
H. Anterior-posterior translation of the ankle joint

IV. ADVANTAGES/DISADVANTAGES
A. Advantages
   1. Reduced morbidity
   2. Reduced hospitalization
   3. Rapid fusion rate
   4. Better cosmesis
   5. Decreased complications
   6. Optional tourniquet
B. Disadvantages
   1. Difficult learning curve
   2. Need for expensive arthroscopic equipment
   3. Inability to correct significant rigid varus/valgus or rotational problems

V. FUSION POSITION
A. Optimal position is neutral for dorsiflexion and plantar flexion
   1. Equinus, especially more than 10°, should be avoided unless patient has polio
B. Calcaneus in 5° of valgus and 5-7° of external rotation

VI. OPERATIVE TECHNIQUE
A. Position supine with fluoroscopic attachment
   1. Soft tissue ankle distraction
   2. Small joint arthroscopic instruments 2.7 30° and 70° arthroscopes, but use a large shaver
   3. Use anteromedial, anterolateral and posterolateral portals
4. Use large fluoroscope
B. Remove about 1 cm of entire articular surface systematically, using shaver, abrader, curettes, rongeurs, as needed
C. Small dimples (spot welds) are placed in the tibia and talus with the burr to facilitate early bone union
D. Always maintain contour of the ankle and avoid squaring the ankle
E. It is very important to extensively debride the medial, lateral and posterior and anterior gutters
F. All osteophytes should be removed, especially the ones anteriorly
G. Once cancellous surfaces with good vascularity are exposed, drill guide is inserted and guide pins are drilled percutaneously into the medial malleolus and lateral malleolus under direct arthroscopic vision
1. Medial pin is inserted 30° in the coronal and 30° in the sagittal plane; medial pin should penetrate the medial malleolus halfway between the anterior and posterior cortex
2. Lateral pin is inserted on the posterolateral edge of the fibula and angled 30° in the coronal plane and 60° in the sagittal plane
3. Pins slightly penetrate the tibial plafond and fibula and then position is checked under fluoro
4. Medial pin is usually inserted first to suck the medial malleolus into the medial aspect of the tibial plafond; then the lateral guidepin is advanced across the joint and the screw inserted
5. Sometimes two screws are inserted in the medial malleolus for a valgus ankle, or two screws are inserted in the fibula for a varus ankle; when this occurs, then a total of three screws are used in each circumstance
6. Always verify under fluoroscopy the position of the guidepins prior to screw insertion, to make sure that they do not penetrate or go near the subtalar joint
H. Cysts and sclerotic bone
1. Excise all cysts
2. Drill sclerotic bone
3. Use DBM paste to fill the cysts arthroscopically prior to inserting screws
I. When position is appropriate, self-drilling self-tapping screws are inserted
1. Screws can be inserted form both medial and lateral sides, or two screws from the medial side; screws should be either 6.5 or 7.3 mm cannulated screws. I use 7.3 AO cannulated screws
J. Postoperatively, the patient is placed in a short leg cast
1. Non-weight bearing for 2-3 weeks and then weight bearing until union is seen on x-ray
2. Some authors start weight bearing in 10-14 days in an AFO or removable boot

VII. RESULTS OF ARTHROSCOPIC ANKLE ARTHRODESIS (see Table 1)
A. Ogilvie-Harris et al. (1993)
1. 19 patients, 14 m, 5 w *(27-59)
2. 17 healed, 2 nonunion
3. Excellent=12; Good=4; Fair=2; Poor=1

B. Corso and Zimmer (1995)
1. 16 patients, average fusion = 9.5 weeks
2. 14 of 16 satisfied with results

C. Glick et al. (1996)
1. Multicenter study; 34 patients
2. Average age = 50 years; average follow-up = 7.7 years
3. Average fusion time = 9 weeks; 97% fused
4. 86% Good/Excellent results

D. O'Brien et al. (1999)
1. 36 patients; 19 scope, 17 open
2. Fusion rates similar with less morbidity, shorter tourniquet time, less blood loss, and shorter hospital stays

E. Cameron and Ullrich (2000)
1. 15 patients, follow-up = 1-3 years
2. Average fusion = 1.5 weeks
3. 5 patients (33%) had complications

F. Zvijac et al. (2002)
1. 21 patients, mean age 53 years
2. Average follow-up = 34 months
3. 20/21 fused; average fusion = 8.9 weeks
4. Excellent = 9; Good = 11; Poor = 1
5. Don’t do in ankles >30% of talus with AVN

G. Kats et al. (2003)
1. 15 patients
2. Group A = 11 patients with unilateral distraction and crossed screws
3. Group B = 4 patients with bilateral distraction and parallel screws
4. Nonunion = 3/11 (Group A); 0 (Group B)
5. Time to fusion = 23 weeks (A); 13 weeks (B)

H. Ferkel and Hewitt (2005)
1. 35 patients
2. 77% were post-traumatic
3. Average follow-up = 72 months
4. Overall fusion rate = 97%
5. Average time to fusion = 11.8 weeks
6. 74% Good/Excellent by Mazur and 83% by Morgan system

I. Jones, Ferkel et al. (2015)
1. 99 patients (101 ankles)
2. Average age was 61 years and average follow-up was 86 months
3. Overall fusion rate = 95%
4. 75% Excellent/Good on modified AOS score; 87% by FAOS score
5. 79% and 66% of patients had no change in talonavicular or subtalar grade of osteoarthritis, respectively

VIII. COMPLICATIONS AFTER ARTHROSCOPIC ANKLE ARTHRODESIS
A. Numerous potential complications
1. Malunion or nonunion
2. Infection
3. Hardware removal
4. DJD in other joints
5. Nerve injury
6. Sinus tracts

B. Crosby et al. (1996) used bi-framed distraction and demineralized bone matrix-bone marrow slurry as a graft substitute
   1. Average follow-up = 27 months
   2. Overall complication rate = 55%, including 3 nonunions, 2 fractures, 4 pin site infections, 1 deep infection, 4 hardware problems, 4 symptomatic painful; subtalar joints
   3. Overall, 85% of patients were satisfied with final result
   4. Demineralized bone matrix and bone marrow do not seem to increase fusion rate over previous studies without the use of graft substitute

IX. TIPS, TRICKS AND PITFALLS FOR ANKLE ARTHRODESIS
A. Take pad off the foot of the bed to get more room posteriorly
B. Always use noninvasive distraction
C. Remove articular cartilage with the full radius shaver blade and ring curettes
D. If unsure about whether procedure can be done arthroscopically, use a fluoroscope in the office with a distraction strap and counter traction to see if the ankle corrects to neutral and if there’s adequate distraction prior to surgery
E. Always protect the nerves, especially the superficial peroneal branches, saphenous nerve and sural nerve
F. Do not take off too much bone and maintain the normal contour of the joint surfaces
G. Use selective injections to verify whether the problem is in the ankle or subtalar joint or both prior to surgery
H. Always do a preoperative CT scan prior to surgery to look at degenerative changes and deformities in all joints of the hindfoot, midfoot and forefoot
I. Always correct malalignment of the hindfoot

X. Coding Ankle and Subtalar Joint Procedures
A. See Table 2
Table 1. Published series of arthroscopic ankle arthrodesis*

<table>
<thead>
<tr>
<th>Study</th>
<th>No. of patients</th>
<th>% Posttraumatic</th>
<th>Fusion Rate (%)</th>
<th>Time to Fusion</th>
<th>Complication Rate (%)</th>
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<tbody>
<tr>
<td>Myerson and Quill</td>
<td>17 arthroscopic</td>
<td>59</td>
<td>94</td>
<td>8.7 wk</td>
<td>11.70</td>
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<tr>
<td></td>
<td>16 open</td>
<td>75</td>
<td>100</td>
<td>14.5 wk</td>
<td>18.70</td>
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<tr>
<td>O’Brien et al.</td>
<td>19 arthroscopic</td>
<td>63</td>
<td>84</td>
<td>Not reported</td>
<td>16</td>
</tr>
<tr>
<td></td>
<td>17 open</td>
<td>82</td>
<td>82</td>
<td></td>
<td>18</td>
</tr>
<tr>
<td>Ogilvie-Harris et al.</td>
<td>19</td>
<td>74</td>
<td>89</td>
<td>12 wk</td>
<td>26</td>
</tr>
<tr>
<td>Corso and Zimmer</td>
<td>16</td>
<td>75</td>
<td>100</td>
<td>9.5 wk</td>
<td>12.50</td>
</tr>
<tr>
<td>Glick and Morgan</td>
<td>34</td>
<td>--</td>
<td>97</td>
<td>9 wk</td>
<td>5.80</td>
</tr>
<tr>
<td>Cameron and Ullrich</td>
<td>15</td>
<td>33</td>
<td>100</td>
<td>11.5 wk</td>
<td>40</td>
</tr>
<tr>
<td>Zvijac et al.</td>
<td>21</td>
<td>90</td>
<td>95</td>
<td>8.9 wk</td>
<td>4</td>
</tr>
<tr>
<td>Cannon et al.</td>
<td>36</td>
<td>55</td>
<td>100</td>
<td>77% fused at 8 wk</td>
<td>33</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>100 fused at 16 wk</td>
<td></td>
</tr>
<tr>
<td>Saragas</td>
<td>26</td>
<td>92</td>
<td>96</td>
<td>10.5 wk</td>
<td>34</td>
</tr>
<tr>
<td>Ferkel et al.</td>
<td>35</td>
<td>77</td>
<td>97</td>
<td>11.8 wk</td>
<td>23</td>
</tr>
<tr>
<td>Winson et al.</td>
<td>116 (118 ankles)</td>
<td>57</td>
<td>92</td>
<td>12 wk</td>
<td>32</td>
</tr>
<tr>
<td>Gougoulias et al.</td>
<td>74 (78 ankles)</td>
<td>49</td>
<td>97</td>
<td>12.5 wk</td>
<td>31</td>
</tr>
<tr>
<td>Nielsen et al.</td>
<td>58 arthroscopic</td>
<td>64</td>
<td>95</td>
<td>1 y</td>
<td>33</td>
</tr>
<tr>
<td></td>
<td>48 open</td>
<td>67</td>
<td>84</td>
<td>1 y</td>
<td>40</td>
</tr>
<tr>
<td>Odutola et al.</td>
<td>32</td>
<td>31</td>
<td>88</td>
<td>14 wk</td>
<td>12</td>
</tr>
</tbody>
</table>


Table 2. CPT Codes for Ankle and Subtalar Arthroscopy

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>29891</td>
<td>Arthroscopy, ankle, surgical, excision of osteochondral defect of talus and/or tibia, including drilling of the defect</td>
</tr>
<tr>
<td>29892</td>
<td>Arthroscopically aided repair of large osteochondritis dissecans lesion, talar dome fracture, or tibial plafond fracture, with or without internal fixation (includes arthroscopy)</td>
</tr>
<tr>
<td>29893</td>
<td>Endoscopic plantar fasciotomy</td>
</tr>
<tr>
<td>29894</td>
<td>Arthroscopy, ankle (tibiotalar and fibulotalar joints), surgical, with removal of loose body or foreign body</td>
</tr>
<tr>
<td>29895</td>
<td>Arthroscopy, ankle (tibiotalar and fibulotalar joints), surgical; synovectomy, partial</td>
</tr>
<tr>
<td>29898</td>
<td>Arthroscopy, ankle (tibiotalar and fibulotalar joints), surgical; debridement, extensive</td>
</tr>
<tr>
<td>29899</td>
<td>Arthroscopy, ankle (tibiotalar and fibulotalar joints), surgical; with ankle arthrodesis</td>
</tr>
<tr>
<td>29904</td>
<td>Subtalar arthroscopy with removal of loose body</td>
</tr>
<tr>
<td>29905</td>
<td>Subtalar arthroscopy with synovectomy</td>
</tr>
<tr>
<td>29906</td>
<td>Subtalar arthroscopy with debridement</td>
</tr>
<tr>
<td>29907</td>
<td>Subtalar arthroscopy with subtalar arthrodesis</td>
</tr>
</tbody>
</table>
References


