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Rheumatoid Arthritis

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Much of what has been presented in the previous chapters of this volume is also applicable to the patient with rheumatoid arthritis. Since Hoffman's¹ classic paper in 1911 on forefoot arthroplasty, however, little has changed in the practical management of crippling forefoot deformities. This chapter is concerned mainly with the surgical management of adult patients with rheumatoid arthritis in need of forefoot arthroplasty.

Vainio² reported 90 percent of adult patients with rheumatoid arthritis had variable degrees of symptoms in their feet. Additionally, the foot is the initial site of involvement in 16 percent of rheumatoid arthritis cases. Pedal involvement is nearly always bilateral. Those patients with arthritis of more than 10 years duration have significant involvement of their feet.

Typical symptoms and signs of the forefoot requiring surgery may include painful intractable plantar callosities or ulcers underlying metatarsal heads, painful ambulation, flatfeet, deformed and contracted toes with corns or ulcers, hallux abducto valgus, hallux varus, medial or lateral displaced lesser toes, painful limited joint motion, digital subluxations and dislocations, anterior displaced plantar fat pad, and inability to wear regular shoe gear (Figs. 34-1 and 34-2). Spreading of the toes secondary to rheumatoid nodules has now been shown to be a presenting symptom of rheumatoid arthritis³ (Fig. 34-3).

Radiographic studies of late-stage arthritis may show severe destructive processes at the metatarsophalangeal joint (MTPJ), dorsally luxated or dislocated toes, hammer and claw toes, osteoporosis, metatarsal fatigue fractures, and sesamoid involvement (Fig. 34-4).

Of course, forefoot manifestations are just one part of a larger disease process with multilevel and multi-system involvement. It must be remembered this is

often a progressive and unpredictable disease. An active, communicative team approach is essential in the management of such patients. Complications from inadequate preoperative planning can be devastating. The foot surgeon needs to be aware of the pathogenesis of the disease, its medical management, and other joint involvement to establish an appropriate temporal pattern for surgical intervention. Concomitant diseases may influence the surgical decisions.

BIOMECHANICAL CONSIDERATIONS

The weight-bearing nature of the foot as well as the disease process subjects the foot to abnormal biomechanical influences that contribute to foot pain, deformity, and disability. Abnormal digital posturing arises mainly from synovitis, joint distention, ligament and skeletal muscle weakness, and cartilage erosion that results in intrinsic muscle destabilization.⁴ Other factors, especially pronation forces, that contribute to foot deformity may include posterior tibial dysfunction, equinus, extremity structural valgus attitudes, and compensation for arthritic joints.⁵

Although a cavus-type foot with rheumatoid arthritis can exist, most arthritic feet demonstrate a flatfoot appearance.^{5,6} Caution is advised when selecting patients with anterior cavus foot for forefoot arthroplasty because postoperative pain may continue from weight-bearing on the remaining metatarsal shaft.⁷ Postoperatively, soft inner soles or soft custom foot orthoses are quite helpful in this patient.

The valgus foot, especially when resulting from hindfoot pathology, may contribute to knee valgus

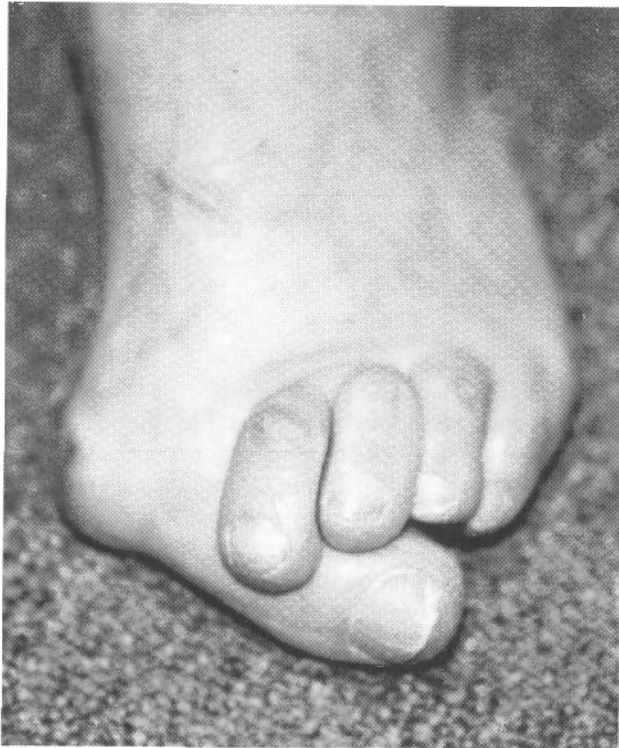


Fig. 34-1. Dorsal view of a typical rheumatoid forefoot.

alignment. It has been suggested that delaying or preventing hindfoot valgus may delay deformity in an otherwise normally aligned ipsilateral knee.⁵ Also, it might be advisable to correct hindfoot malalignment before knee arthroplasty to minimize abnormal stresses on an implant.⁵ This author agrees with Schuberth⁸ in that forefoot arthroplasty should be carried out before hindfoot arthrodeses if needed. In this manner, compensation for forefoot malalignment can be accounted for by selective rearfoot wedging, whereas the converse is unlikely.

Clinical evaluation of both the static and dynamic foot with rheumatoid arthritis suggests abnormal plantar forces at work. The gait in late disease is often antalgic bilateral and of a flat, shuffling type.⁵⁻⁹ Forefoot disability often arises from dorsally located toes with anterior fat pad displacement and resultant depressed metatarsal leading to great forces at the ball of the foot with resultant metatarsalgia, plantar callouses, and ulcerations. Forefoot arthroplasty will reduce abnormal pressure under the forefoot and may increase mobility.⁹ A shuffling gait indicates an attempt to minimize joint motion and to increase the period of flat foot and area of weight-bearing to attain decreased peak plantar pressures in any one area.¹⁰

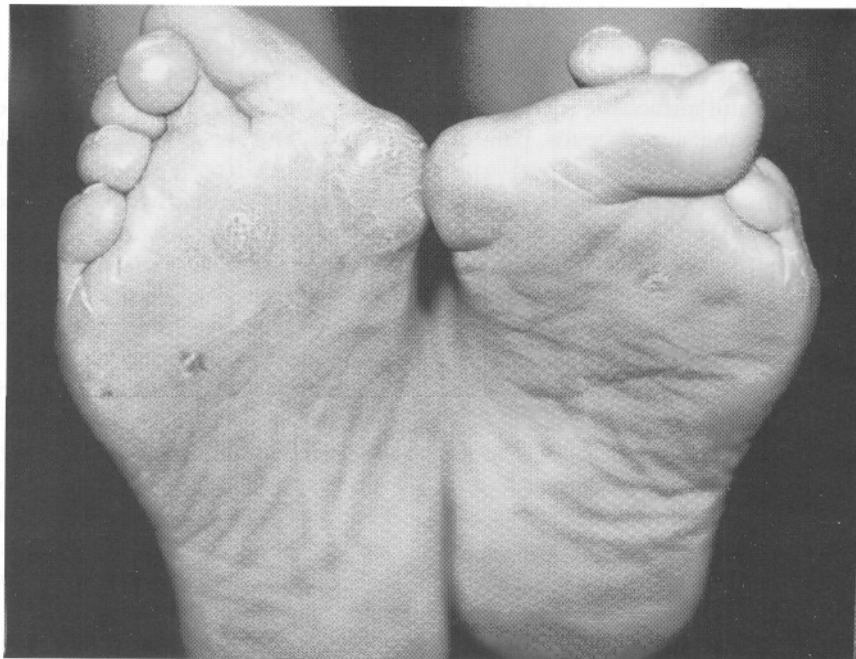


Fig. 34-2. Plantar view of typical rheumatoid forefoot.

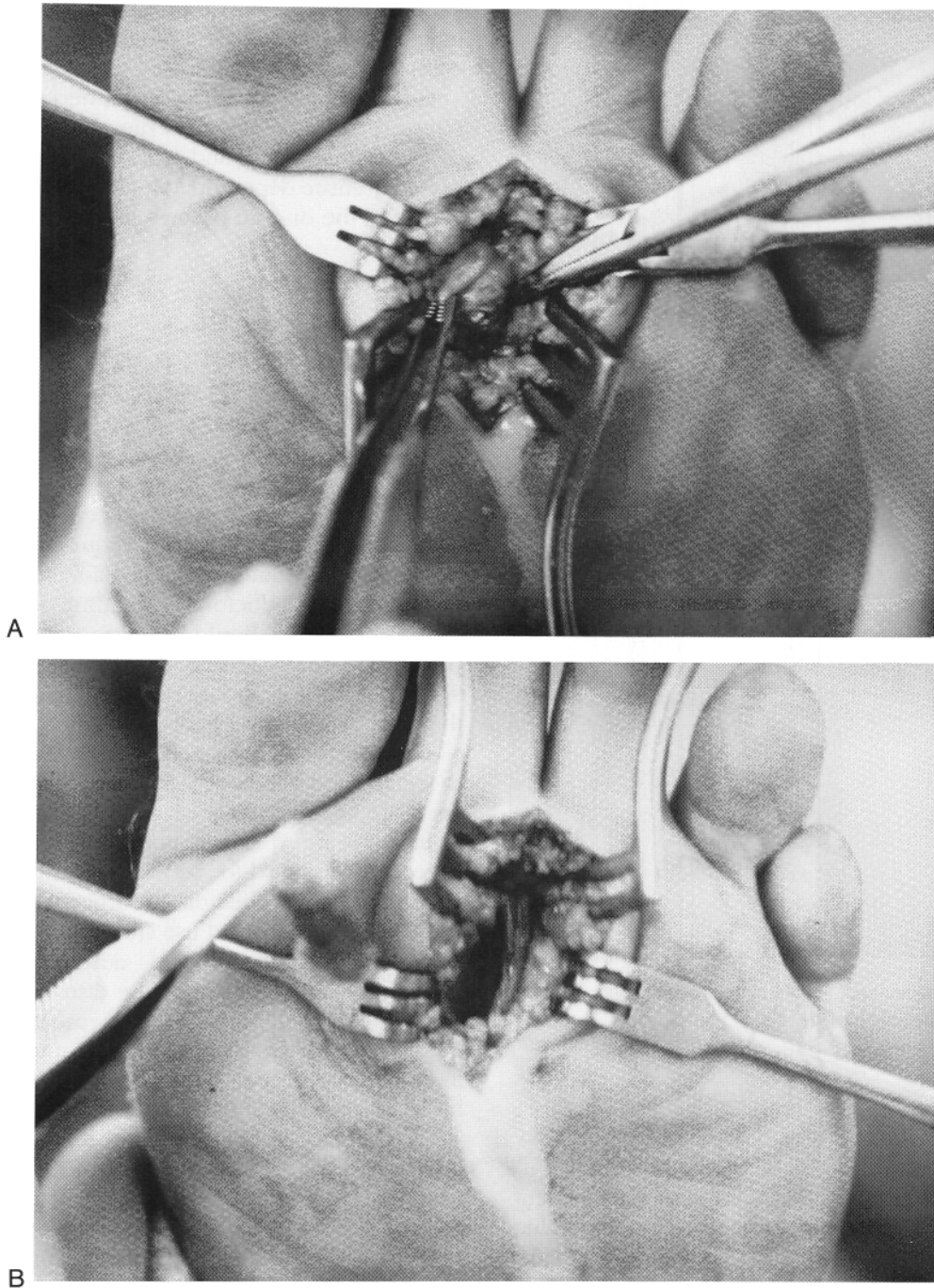
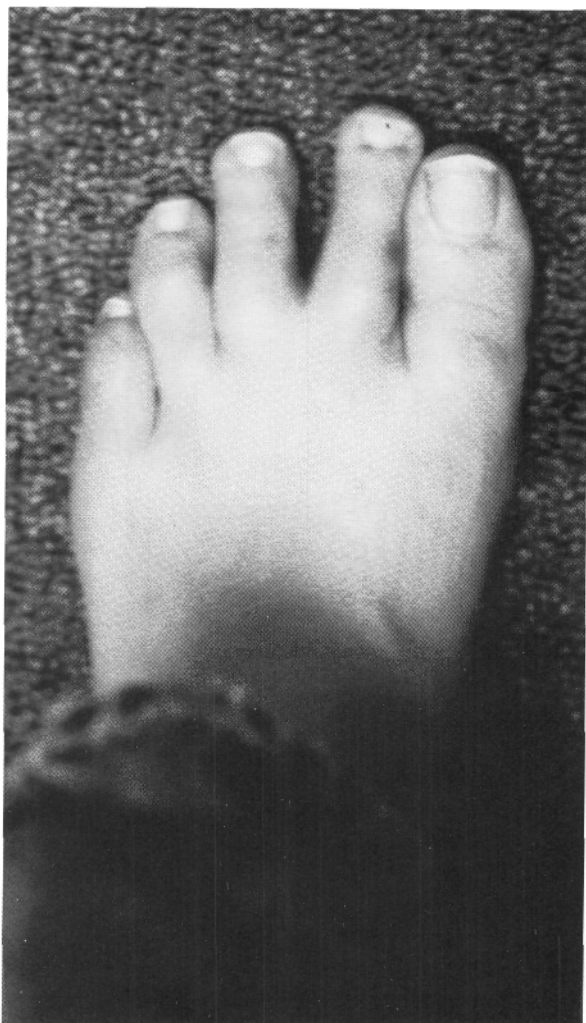


Fig. 34-3. Rheumatoid nodule. A 33-year-old white woman presented with complaints of spreading toes on both feet and neuroma-type pain. She also had bilateral carpal tunnel syndrome. Subsequent histologic analysis revealed a rheumatoid nodule and she eventually became seropositive. (**A**) The plantar common digital nerve is being retracted by forceps; the hemostat points to the underlying nodules. (**B**) The nodule is excised and the nerve is back in place. (*Figure continues.*)



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Fig. 34-3 (Continued). (C) Three weeks postoperative, with residual spreading of the toes.

PROCEDURE OBJECTIVES

Pain relief is the primary goal in surgical management. This objective is achieved through deformity reduction and excision of diseased tissue. Secondary gains that can be expected include ease of wearing shoe gear, increased gait stability, improved function, avoidance of ulcerative lesions, and cosmetic appearance. Occasionally, surgery may be needed not for pain relief but more for recurrent ulcerative infections, espe-

cially in those patients requiring chronic or intermittent therapeutic use of immunosuppressive and antineoplastic drugs.

Functional improvement is not necessarily a prime objective and may not be achievable. Patients should be forewarned of this and, in fact, functional deterioration may ensue depending on the surgical procedures used and the disease process itself.^{7,11-13}

PATIENT SELECTION AND PREOPERATIVE CONSIDERATIONS

The candidate for forefoot arthroplasty usually already has an advanced disease process. Nonsurgical care has typically been exhausted or ineffective, and therefore deciding if surgery is actually required is straightforward. However, numerous considerations must be taken into account before proceeding. A thorough history and physical should be performed by an appropriate physician. Concurrent management of other systems pathology should be pursued. Concurrent orthopedic care may be necessary.

A preoperative evaluation of the patient is essential to identify and minimize risk factors. Although beyond the scope of this chapter, an excellent review has been given by White.¹⁴ Salient points are presented here, especially in regard to reconstructive foot surgery.

Drug therapy at the time of surgical planning needs to be evaluated. Steroid use should be supplemented perioperatively to prevent adrenocortical crisis. Methotrexate therapy should be discontinued at least 1 week before surgery and not resumed until adequate skin healing has taken place. Surgery may need to be postponed until the active process is controlled by pharmacologic and physical means.

Surgery should be postponed in the patient with active rheumatoid vasculitis to avoid severe vascular and dermatologic consequences. Vasculitis may also indicate the rheumatoid disease is not under control. Organic occlusive arterial disease may exist and should be detected, evaluated, and treated if necessary, including the associated risk factors. Thromboembolism prophylaxis is not necessary unless the patient is immobilized and at risk. Otherwise, simple surveillance is mandatory.



Fig. 34-4. Typical radiographic appearance of the forefoot requiring surgery. Note the dislocated toes, erosive joint changes, osteoporosis, and healing metatarsal fatigue fractures.

Wound healing can be a problem in the rheumatoid arthritis patient. For instance, corticosteroid and methotrexate can delay wound healing by diminishing the tensile strength. The skin is usually thinner in the older patient and may be exacerbated in the rheumatoid arthritis patient secondary to changes in collagen metabolism.¹⁵ The presence of Felty syndrome (rheumatoid arthritis, splenomegaly, leukopenia) can increase the infection rate.¹⁵ Other preoperative considerations include age of the patient, potential for rehabilitation, extent of deformity, location and extent of pain, activity level, motivation level, presence and location of rheumatoid nodules, and, of course, disease activity progression.

Prophylactic antibiotic use is almost routine in rheumatoid foot surgery. The reasons for antibiotics may include implant use, extensive exposure, multiple incisions, prolonged surgery, and a debilitated and immunocompromised host. The antibiotic benefits

clearly outweigh the risks. Specific preoperative criteria for successful surgery typically include a patient older than 50 years, severe forefoot arthritis, severe metatarsalgia, toe deformity, and a painful propulsive gait.

In my experience, local standby anesthesia is sufficient for forefoot arthroplasty in either ankle, midfoot, or ray infiltrative blocks. Bilateral forefoot surgery may require a lower percentage of a local anesthetic because of the greater volume necessary. There seems to be a poor "take" of local at lower percentages in the rheumatoid patient. In this case, epidural may be better suited, especially if prolonged surgery is anticipated. General anesthesia is rarely, if ever, recommended. If so, cervical flexion/extension radiographs should be obtained to evaluate cervical disease, and the anesthesiologist must be alerted.¹⁴

Extreme upper extremity involvement may limit surgery to one foot at a time to avoid unsafe use of

ambulation aids. Home health care, family support, and home modifications (e.g., commode, wheelchair access, stairs) are necessary preoperative considerations for the patient's ease and safety.

PROCEDURE SELECTION

The original Hoffman procedure from 1911 is still the gold standard in forefoot arthroplasty.¹ There have been several modifications of this procedure that merit review.

Hoffman¹ used a single, curved, transverse incision on the plantar foot distal to the metatarsal heads, and he excised the heads. This approach relieved the severe metatarsalgia, provided access to the plantar-flexed metatarsals, yet placed the incision distal to weight-bearing areas. This approach usually protects the vessels at this level that are deep in the intermetatarsal spaces.

Larmon¹⁶, in 1951, used a three-incision, longitudinal, dorsal approach: the first incision was over the first metatarsophalangeal joint, the second between the second and third metatarsal heads, and a third between the fourth and fifth heads. A Keller procedure and removal of the plantar portion of the lesser metatarsal heads is performed.

Fowler¹⁷, in 1959, made a dorsal transverse incision over the five metatarsals proximal to the toe webs. The proximal one-half of the proximal phalanges are removed, and the metatarsal heads are shortened and contoured. Anterior displacement of the fat pad is addressed by removing an ellipse of skin plantar and proximal to the metatarsal heads.

Clayton¹⁸, in 1963, through a dorsal transverse approach excised all the metatarsal heads and bases of the proximal phalanges. Extensor tendons are transected without repair.

Kates et al.¹⁹, in 1967, modified the original Hoffman approach. A single transverse plantar approach with the convexity proximal is made, and the metatarsal heads are excised. The phalangeal bases are left intact. A second proximal incision is then made forming an ellipse of skin that is excised to realign the fat pad. Sesamoids are excised if necessary.

Dwyer²⁰ in 1970 suggested a procedure to resect all the metatarsal heads and arthrodesis the hallux meta-

tarsophalangeal joint and proximal interphalangeal joints of the lesser toes.

Swanson²¹ in 1979 advocated using flexible stem silicone implants of the great toe. Cracchiolo²² later also suggested using silicone implants in all metatarsophalangeal joints.

Hoder and Dobbs²³ in 1983 used a five-incision, dorsal longitudinal approach. Each incision is centered over a metatarsophalangeal joint. This approach presumably lessens the chance of vascular compromise and lymphatic obstruction.

Finally, in 1988 McGarvey and Johnson¹² modified Larmon's approach by modifying the lateral two incisions into Y-shaped incisions extending up the adjacent sides of the second and third as well as the fourth and fifth toes to the proximal interphalangeal joint (PIPJ) level. This technique is chosen to provide postoperative digital stabilization by syndactylization at closure.

Procedure Selection: Key Points

A review of the already referenced sources demonstrates satisfactory reports, at least in the short term. The few long-term studies and literature reviews generally show a gradual deterioration of results over many years.^{11-13,23-27} Recommendations based on all these papers are presented.

The incisional approach to the forefoot arthroplasty is essentially irrelevant as to the final outcome, but certain points regarding incisions should be made. Plantar incisions allow easy access to metatarsal heads with dorsally subluxed toes and should be made at or distal to the metatarsal heads to avoid vascular embarrassment and painful plantar scars. A plantar ellipse of skin to realign the fat pad is not necessary if digital reduction is obtained. Plantar incisions may require immediate, protected, postoperative weight-bearing to prevent dehiscence.

Dorsal incisions should be longitudinal because transverse incisions prolong the swelling; ambulation can be nearly immediate. The three-incision approach is most commonly recommended and provides good exposure. The five-incision approach is good for the novice surgeon for ease in dissection but should be used in caution in narrow or small feet because of potential vascular compromise in closely placed incisions. Dorsal incisions generally have more swelling

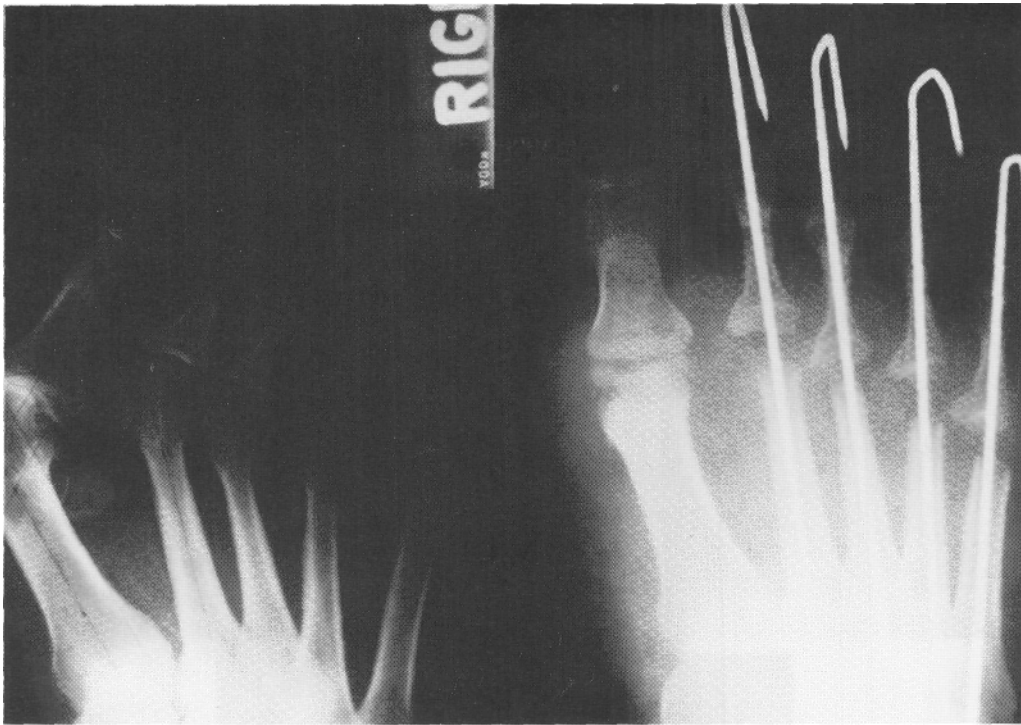


Fig. 34-5. Pre- and postoperative panmetatarsal head resection with implant and K-wire stabilization. Note the decrease in the intermetatarsal angle and the cascading metatarsal parabola.

than plantar incisions (personal observation). A combined dorsomedial approach for the first MTPJ and plantar approach under the lesser metatarsals is this author's favorite approach in patients without vascular disease.

Once the incision placement is determined, osseous procedures should be selected. Procedures for the first MTPJ should be some type of stabilizing option to prevent recurrence. Specifically, resection total hinged implant or resection arthrodesis should be considered (Figs. 34-5 and 34-6). Indications, techniques, and precautions outlined in other chapters of this book should be followed in choosing the technique to be used.

Resection arthroplasty has the greatest rate of failure and dissatisfaction and should be reserved for short-term relief (Fig. 34-7). Modular implants should not be used until long-term studies are completed.²⁸ Implants should not be used in the presence of abnormal biomechanical stresses or unreduced high intermetatarsal angles. Sesamoids should be excised if they pre-

vent reduction of deformities, contribute to plantar pain, or are severely diseased and displaced.

Reduction of the increased metatarsus primus adductus angle by osteotomy is suggested by some authors. This is not needed, as this increased intermetatarsal angle is positional and reduced by adequate decompression of the retrograde forces of the great toe. This is especially true with great toe arthrodesis.²⁹

The lesser toe deformity and metatarsalgia should initially be addressed at the MTPJ level. Specifically, generous resection of the metatarsal heads should be carried out. The resulting metatarsal parabola length should generally be with the second the longest followed by the first, third, fourth, and fifth. I have observed no problem in leaving the first metatarsal as long or slightly longer than the second. In addition, the osteotomies should be angled from dorsal distal to proximal plantar. The first and fifth metatarsal shaft should be also angled proximal medial and proximal lateral, respectively. Resect either metatarsal heads or



Fig. 34-6. Panmetatarsal head resection with arthrodesis. (A) Steinman pins are used with osteoporotic bone. (B) Internal screw fixation is used in relatively good bone stock.



Fig. 34-7. Panmetatarsal head resection with resection arthroplasty of the first metatarsophalangeal joint in extremely osteoporotic bone.

none; the exception may be excising only the lesser metatarsal heads if the first is disease free. Single head resection is a poor choice. Total implants of the lesser MTPJ are generally not feasible because of the amount of bone resection needed.

Phalangeal bones, unless greatly enlarged or long, should be left in place. Digital reduction may require either manipulative reduction, resection arthrodesis, resection implant, or even resection arthroplasty at the PIPJ level. Each digit should be evaluated singly after MTPJ arthroplasty. The fifth should not be arthrodesed.

Kirschner wire (K-wire) stabilization should be used for lesser toe arthrodesis. There is little evidence to show that K-wire stabilization of the MTPJ actually increases long-term stabilization. When used, however, wires should cross all interphalangeal and metatarsophalangeal joints and be left in place for 4 to 6 weeks. Digital syndactyly up to the PIPJ shows early promise for long-term stability. Naturally, syndactyly of both sides of a toe simultaneously is not recommended to

avoid potential vascular embarrassment. Digital incisions should be longitudinal and may be elliptical to reduce excess skin.

Adjunct procedures, including tendon balancing and rheumatoid nodule excision, need to be addressed individually. Intraoperative radiographs should be taken to ascertain correct metatarsal parabola. Bone fragments remaining in the plantar region need to be removed. Silicone polyester metatarsal caps have yet to be demonstrated useful on a long-term basis.

POSTOPERATIVE CARE

Postoperative care should include monitoring for vascular compromise, controlling edema by bed rest and elevation for 24 to 48 hours, and using drains as indicated. Sutures should be left in place for 3 weeks and augmented with adhesive wound bandages as needed

to avoid discharge. K-wires are removed at about 4 weeks.

Ambulation can be resumed on a very limited basis at 24 to 48 hours after surgery using surgical shoes. These shoes should have a premolded soft arch support with a metatarsal pad to keep the fragile foot padded and toes plantar-flexed. Prolonged immobilization is to be avoided. Physical therapy is essential to aid in ambulation. Home care may be needed.

Long-term problems may include recurrence of abnormal digital posturing, recurrent hallux valgus or varus, plantar ulcers or lesions, implant or arthrodesis failure, recurrent pain, and difficulty with shoe gear. Long-term care includes use of custom-molded soft foot orthoses and extra-depth, stable shoes with rocker bottom soles. The patient should be followed for more than 5 years. Again, a team approach is essential in the postoperative management.

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