PROCEDURAL CHOICES FOR FOREFOOT ARTHROPLASTY IN RHEUMATOID RECONSTRUCTIONS

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INTRODUCTION

Rheumatoid arthritis is a systemic inflammatory arthropathy characterized by a symmetrical polyarthritis, and this symmetry is quite prevalent with regard to development of forefoot deformities.[1-3] The metatarsophalangeal (MTP) joints are most frequently involved, often with all 5 articulations in both feet (Figure 1) Most striking is the severity of forefoot involvement, commonly with gross dislocation of the MTP joints and associated disfigurement of the toes. The deformities gradually progress from somewhat flexible or semi-reducible to non-reducible and rigid in nature.

Deformities may range from very severe dislocations to relatively limited involvement. The clinical picture may be quite varied from patient to patient. Standard procedures involving surgical management of rheumatoid deformities such as Hoffmann[4] or Clayton[5,6] forefoot reconstruction involve significant resections of the level of all MTP joints and/or toes.

Generally, the rheumatoid forefoot conjures deformities that may include luxatory hallux valgus, severe hammertoe deformities with dorsal and lateral (fibular deviation) dislocations at the MTP joints.[7] Bunion or hallux valgus deformities with digital and metatarsal dislocations are the concern of this discussion in the pathology addressed in a so-called forefoot arthroplasty.

The deformities may vary with regard to rigidity and severity, while symptoms vary from the arthralgias of chronic rheumatoid synovial joint inflammation to those of altered mechanics as a result of the development of deformity to severe functional limitations. Clinically, the inflammatory process of the disease may diminish or at some point "burnout" during its course and it is generally at this point that surgical reconstructions are performed.

The problems of rheumatoid arthritis are not new, and surgeons have recommended diverse surgical cures. These have ranged from excision of the metatarsal heads to amputation of each of the toes. A short historical perspective of this diverse surgical approach will be reviewed. Hopefully, with a few ideas from the past combined with our present experiences, a thoughtful surgical approach to the correction of these deformities will be developed.

But should all patients with rheumatoid arthritis be treated with the same extensive ablative procedures? This paper will review procedural selection from a historical perspective and then the author will provide his viewpoint and discuss his experience of the surgical management of the forefoot deformities.

Figure 1. This elderly female presents with end-stage deformities that illustrate this symmetry in typical features of rheumatoid arthritis. Hallux valgus is usually accompanied by dorsolateral MTP joint dislocations and hammertoe deformities, (A) AP left foot, (B) AP right foot. The hindfoot may also be involved but ankylosis is most prevalent with calcaneal erosions and often ankle involvement (C) lateral left foot, (D) lateral right foot. Marked osteopenia is the general rule.

HISTORICAL APPROACH TO THE SURGICAL MANAGEMENT OF FOREFOOT DEFORMITIES

Most authors identify Hoffmann[4] as the initial proponent for the surgical management of the rheumatoid forefoot. Interestingly, Hoffmann did not specifically recognize the condition of rheumatoid arthritis and recommended resection of all the metatarsal heads through a single plantar incision for the most severe cases of claw toes with MTP joint dislocations.

Although initially termed rheumatoid arthritis by Sir Alfred Garrod in the 1800s, it was not until 1941, that the American Rheumatism Association recognized rheumatoid arthritis as a distinct disorder.[8] The Arthritis Foundation was established in 1948 but probably not until the introduction of the 1958 American Rheumatism Association diagnostic criteria[9] did the term "rheumatoid arthritis" become more prevalent in the literature. The routine use of plain film radiographs and the development of the subspecialty of rheumatology have been important medical developments that have contributed to the accurate diagnosis and treatment of rheumatoid arthritis.

Thompson[10] in 1937 recognized the contribution of arthritis to the symptoms and severity of the deformities, although he believed that splinting and rest would limit the extent of deformity. He recommended a variety of potential procedures, from the Keller bunionectomy to resection of the entire proximal phalanx to digital amputation. He suggested that treatment be individualized to the patient and presenting deformity and that surgery be delayed until acute symptoms of the arthritis have resolved.

Key[11] differentiated rheumatoid from degenerative deformities and recommended multiple procedures, possibly 10 or more, to correct the multiplicity of forefoot conditions. He discussed the merits of the Keller bunionectomy with or without excision of the sesamoids as well as the potential need for first metatarsal base osteotomy to reduce the intermetatarsal angle. Key recognized the lesser MTP joint dislocations and the requirement for bowel resection for reduction of deformity, either resection of the base of the proximal phalanx and, at times, the metatarsal head as well. He cited the Hoffmann procedure but admitted to the performance of limited, partial metatarsal head excisions through a dorsal incision.

Marmon[12] described combining a Keller bunionectomy with lesser metatarsal head excision. This was performed through 3 incisions: a dorsal longitudinal one over the first ray while the metatarsal heads war excised through web space incisions between the second and third, and fourth and fifth toes, respectively.

The deformities associated with rheumatoid arthritis certainly impressed surgeons attempting to address patient suffering. In 1957, Nissen[13] advocated amputation of all the toes with disarticulations of the MTP joints and remodeling of the metatarsal heads to relieve the pain and deformities. Flint and Sweetnam[14] also advised amputation of all the toes in the technique described by Nissen.

Fowler[15] designed his operation for the "severest claw toe deformity when it is impossible to restore the normal anatomy of the MTP joints, and when there is severe pain under the prominent metatarsal heads." His incisional approach was unique, with a dorsal transverse incision over the MTP joints that curves proximally a short distance along the shafts of the first and fifth metatarsals. The osseous resections included the proximal half of the proximal phalanges and remodeling of the metatarsal heads. He described a fairly straight-line parabola from the distal aspect of the first through fifth metatarsal heads with complete excision and remodeling of the plantar condyles. Fowler also recognized the anterior advancement of the plantar fat pad. He recommended excision of a plantar transverse skin wedge proximal to the metatarsal heads to replace the soft tissue pad underneath the metatarsal heads.

Clayton[5] described more aggressive osseous resection that included the phalangeal bases as well as the metatarsal heads through a single dorsal transverse incision. He recommended excision of the second phalangeal base, then third followed by the fourth. If the fifth toe deformity was insignificant, it was left undisturbed. The hallux could then be approached more easily as a result of the laxity from the lateral bone resections. This technique then allowed access to the metatarsal heads, which were excised in the same sequence with a progressive shortening from the second to fifth metatarsals. He recommended that the first and second metatarsal be the same approximate length and that the first metatarsal should possibly be left intact if it was significantly short preoperatively.

In 1963, Clayton further expounded on the forefoot arthroplasty. He admitted to performing excisional arthroplasty only on one or two toes, although he acknowledged that usually all the metatarsal heads required removal.[6] Clayton recommended that if three or more metatarsals required excision, all 5 should be performed. He corrected the distal joints of the toes by manipulation and emphasized adequate bony resection. He believed that the incisional approach was of minor significance.

Kates and associates[16] described a modification of the Hoffmann and Fowler procedures performed through

an excisional skinplasty plantar and proximal to the metatarsal heads. This was planned to accomplish a similar function to the Fowler excision of a plantar skin ellipse. Their osseous resections included the entire metatarsal head in the curved parabolic manner. The first MTP joint sesamoids were usually excised with the metatarsal head and the arthroplasty stabilized with an axial Kirchner wire.

Raunio and Laine[17] reported good results with MTP joint synovectomies in patients with mild disease. Aho and Halonen[18] in also praised synovectomies in patients with joints symptoms unresponsive to medical management or in those with limited deformity.

Lipscomb and associates[19] discussed resection of the proximal phalangeal bases with remodeling of the lesser metatarsal heads and either a Keller arthroplasty or first MTP joint arthrodesis. They used a medial longitudinal incision on the first MTP joint with dorsal lineal incisions between the second and third, and fourth and fifth, MTP joints. Following the first ray procedure, the lesser joints were approach. The extensor tendons were divided, and a generous resection of the proximal phalanx was performed. The plantar condyles of the metatarsal heads was resected flush with the metatarsal shaft. They also used Kirschner wires in the toes and retrograded into the metatarsals to maintain the toes in a position of 20° of flexion for three weeks postoperative. Ambulation in Reese shoes was
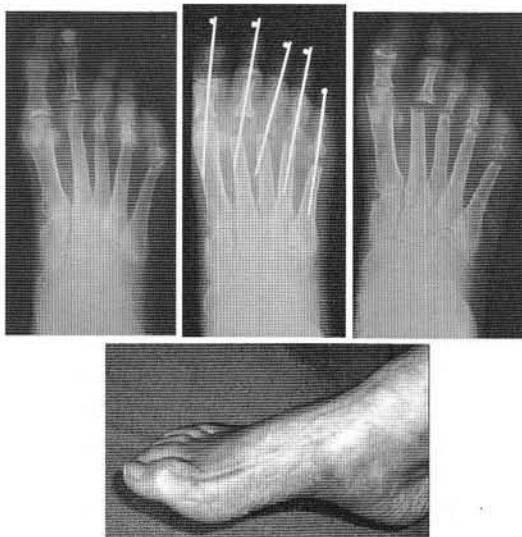

Figure 2. This patient presented with the training synovial cyst plantar to a 3rd MTP joint right foot. For preoperative radiograph (A) shows from the lateral MTP joint involvement with sagittal plane dislocation of the 3rd MTP joint. A Keller bunionectomy combined with Panmetatarsal head resections and Post arthroplasties of the toes was performed; (B) illustrates the 2 week postoperative AP radiograph. At 6 months (C), are radiographs illustrate relatively good position but early flexion of the hallux IPJ. Our clinical picture at one year post-op (D) shows a moderate hallux flexus deformity that may develop following the Keller procedure.

allowed after three or four days and continued for two to three months postoperatively and until edema subsided.

DuVries[20] recommended first MTP joint arthrodesis with excision of the proximal phalangeal bases. DuVries rationalized that the stable MTP joint allowed weight-bearing by the first ray, yet flexibility was retained through the hallucal interphalangeal joint and metatarsal cuneiform joints. DuVries began with the first MTP joint arthrodesis through a long first web space incision that extended proximally over the medial aspect of the first metatarsal base. Fixation was accomplished with a dorsally placed staple. An abductor release and fibular sesamoidectomy could be performed before the arthrodesis. Then through the same incision, the second MTP joint was exposed and the phalangeal base excised. A second incision was made from the third webspace distally and extending proximally over the fourth MTP joint. Through this incision, the bases of the third and fourth toe proximal phalanges were excised, and the fifth, if necessary, was also excised. He also recommended leaving the metatarsal heads untouched. He labeled this the DuVries-Dixon procedure.

Mann and Coughlin[21] recommended a similar approach combining arthrodesis of the first MTP joint with basal resection of the proximal phalanges and variable remodeling of the metatarsal heads. Their report probably still reflects the prevailing orthopedic opinion in the surgical treatment of the forefoot deformities of rheumatoid arthritis.

In the 1980s, podiatric surgeons for the most part differed from this approach in both the procedures of the first and lesser MTP joints. Both Hugar and Gudas[22] and Hodor and Dobbs[23] recommended pan-metatarsal head resection, one through five, with both recommending dorsal lineal incisions. The earlier report actually described subtotal bone resections of the metatarsal heads at the surgical neck thorough a 3 incision approach, whereas the other authors used five lineal dorsal incisions to perform complete metatarsal head resection.

Panmetatarsal head resections or modifications of the Hoffmann-Clayton type procedures have been performed with success in the rheumatoid foot with hallux valgus and lesser MTP joint luxations. With the advent of silicone implants, the Hoffmann Clayton procedures were first combined with the Keller and hemi-implant (Figure 2). Many of these procedures failed because of the length discrepancy created between unaltered first metatarsal and the significantly shortened lesser metatarsals. The hallux was inherently unstable and lateral dislocation was common.

In the 1980s, a modified Hoffmann procedure was performed with resection of the distal portion of the first

metatarsal and use of a double stem hinged implant. This improved the stability of the first MTP joint compared with the Keller arthroplasty or hemi-implant (Figure 3). The double-stem implants may provide some degree of transverse plane stability, but adequate soft tissue relaxation and correction of the deformity must be accomplished. Recurrence of deformity may occur with frontal plane rotation of the implant within the medullary canals.

Cracchiolo[24] discussed the modifications of various procedures of the forefoot arthroplasty. The first MTP joint may be treated with either excisional arthroplasty of the pharyngeal base, metatarsal head, or both, or the joint may be stabilized by fusion or with the double-stem

Figure 3. These postoperative radiographs illustrate the chronology of the use of various silicone implants. The first patient (A) underwent a Keller with a hemi silicone great toe implant and was left with a extreme length discrepancy between he and first in lesser metatarsals. This situation generally lead to significant recurrence of hallux valgus deformity postoperatively. The second patient(B) underwent a Swanson double-stem silicone implant. When combined with pain and metatarsal head resections, adequate resection of the distal first metatarsal is also required to maintain normal anatomical relationships. The third patient (C) shows insertion of double-stem hinge silicone implants into each MTP joint as well as a closing base wedge osteotomy. The lesser MTP joint implants were attempts to provide long-term stabilization of these joints. Malposition was not uncommon with rotation, as noted at the 2nd and 3rd MTP joints, or dislocation of the stems out of a medullary canal or simply fracture of the implant. The fourth patient (D) illustrates the evolution of technique with incorporation of titanium grommets as a protective interface between the silicone implant and bone.

silicone implant. The lesser MTP joint contractures may be addressed with excision of the metatarsal heads, phalangeal bases, or both as well as the insertion of silicone implants in each. Cracchiolo's incisional approach was through a plantar transverse incision place just proximal to the metatarsal heads. He believed Hoffmann's incision was too far distal, had a greater likelihood of neurovascular damage, and did not allow for repositioning of the plantar fat pad.

McGlamry and Bernbach[25] discussed forefoot arthroplasty with pan-metatarsal head resections and recommended leaving the phalangeal bases and their soft tissue attachments intact. A metatarsal length pattern of 2 >1 > 3 > 4 > 5 from longest to shortest was the objective performed through plantar transverse incision. They used digital fusions of the central three toes and believed that this helped stabilize the lesser MTP joints. Kirschner wire stabilization of the toes across the MTP joints was used. They concluded that the plantar approach was the most practical when severe dorsal contractures of the toes (dorsal dislocation of lesser MTP joints) were present.

Vanore and associates[26] discussed forefoot arthroplasty as variations of the Hoffmann procedure: first MTP joint double-stem flexible hinge silicone arthroplasty with resection of all the lesser metatarsal heads. They recommended all MTP joint resections be stabilized with 0.062 inch Kirschner wires retrograded from the tips of the toes deep into the metatarsal bases. They cited poor results with the hemi-silicone implant because of length discrepancies of the first versus the lesser metatarsals (Figure 3). Other procedures performed but not recommended were double-stem silicone arthroplasty of all the MTP joints as later recommended by Pfeiffer et al.[27] They performed this with both the Swanson type hinged implant and the Sgarlato lesser MTP joint implants. Problems occurred with dislocations of the stems and difficulties obtaining a properly sized implant as well as one that fit properly within the medullary canals. They concluded that wire stabilization for six weeks relocated the plantar fat pad under the distal metatarsal segments and was more important to the final result than the use of lesser MTP joint implants. An alternative to Kirschner wires was offered by Tanaka et al[28] who advocated use of 2mm absorbable PLLA pins across both the lesser MTP joints as well as the PIPJs of the toes.

Barouk[29] introduced the concept of a temporary metallic spacer or "button," that is interposed at the resected MTP joint. He used these in all five MTP joints for forefoot arthroplasty. These "button spacer cups" have a central hole so that an axial Kirschner wire may be inserted down the long axis of the digital and phalanx and

then retrograded into the respective metatarsal. The Kirschner wire may be removed one month postoperatively, whereas the Barouk buttons are extracted 6 months postoperatively.

Occasionally, proliferative bone at the amputated stumps of the metatarsals has led to plantar keratotic lesions. In an effort to minimize this phenomenon, Zang recommended the use of silicone rubber caps over the lesser metatarsal stumps. These were discontinued due to a relatively frequent finding of bone resorption underneath the cap.

McGlamry and Martin[30] acknowledge the success of the Hoffmann procedure in the rheumatoid foot as well as its application of a variety of forefoot derangements, including diabetic ulcerations of the forefoot in the pain and deformities of the iatrogenic foot. They acknowledge the success of the plantar approach in the severely deformed foot, but preferred 5 dorsal longitudinal incisions. These incisions allow access to both toes and MTP joints while avoiding the neurovascular structures. Implant arthroplasty was used in the first MTP joint in most situations, but avoided in patients with neuropathic disease and prior infection.

In 1984, Mann and Thompson[31] recommended first MTP joint arthrodesis combined with excision of the basal portion of the proximal phalanges and subtotal to complete excision of the metatarsal heads. They observed that recurrence of fusion was likely with resection arthroplasty of the first MTP joint and that arthrodesis provided maintenance of correction. Stability of the first MTP joint is best accomplished by fusion. This has been reiterated by Coughlin,[32] and Yu and Thornton[33] have suggested that this may be the preferred method of forefoot arthroplasty. The conclusion of Hasselo and associates[34] is that fusion provides a more stable foot for gait and greater likelihood for long-term maintenance of correction in the presence of rheumatoid disease. However, Grondal[35] found little difference and stated that the Mayo resection may still be a good alternative in rheumatoid forefoot reconstruction with little difference postoperatively with regard to hallux IPJ symptoms.

More recently, Coughlin,[32] has concluded that first MTP joint arthrodesis is stable long-term and helps to protect the lesser MTP joints from postoperative subluxations. Generally, some degree of abduction of the great toe is desirable in rheumatoid reconstructions. First MTP joint arthrodesis allows the surgeon to place the great toe in optimal position and with confidence that the toe position will not be maintained following successful fusion.

THE FOREFOOT ARTHROPLASTY

Forefoot arthroplasty may vary both with the surgical procedures performed (Table 1) as well as the specific incisional approach chosen. Careful preoperative evaluation including clinical and radiographic examination allow assessment of deformity. Procedures have somewhat different postoperative regimens in the patient must be a willing participant for their successful conclusion.

The list of deformities may be quite long and involve more proximal joints including the ankle/hindfoot and knee. Careful considerations for other areas of involvement helps to avoid postoperative difficulties. Our discussion for the most part will be limited to the forefoot deformities. Hallux valgus, lesser MTP degree of surging joint dislocations and hammertoes all are generally present in most rheumatoid feet. The areas of involvement, degree of severity particularly with regard to deformity such as joint dislocation and the rigidity of the deformity may influence both the choice of procedures as well as the incisional approach. Certainly, other factors that need to be considered include: 1st-2nd intermetatarsal angle, presence of an unstable medial column. Other comorbid factors include: severe osteopenia, obesity and advanced age as well as the general medical health of the patient particularly with regard to cardiovascular disease and ability of the patient to withstand surgery and then subsequent sedentary requirements of the postoperative course.

As can be seen from the preceding historical discussion, the procedural decision-making process is quite dependent upon the location of pain and deformity. Today, medical management of inflammatory arthritides involves disease modifying drugs that may limit deformity and negate some of the early surgical interventions when joint pain without deformity is present. Our current approach is similar with assessment of location of deformity and need for surgical intervention followed by a rational procedural approach.[36]

THE FIRST RAY

The surgical management of the first MTP joint deformity has been one of the most controversial over the years with recommendations for resection arthroplasty versus arthrodesis or implant arthroplasty. In the early years, resection arthroplasty certainly allowed for the immediate reduction of deformity but stability was poor and development of subsequent deformity and/or biomechanical arrangement was not uncommon. My own experience with first MTP joint implant arthroplasty has predominantly

Procedural Selection for Treatment of Rheumatoid Foot Deformities

Forefoot Arthroplasty

DEFORMITY

1st Ray Deformity	Lesser MTP Jts	Toes
Hallux Valgus Hallux Varus No Deformity	Lateral Subluxation Total Dislocation No Deformity	Flexion PIPJ Flexion/Extension DIPJ No Deformity

PROCEDURES

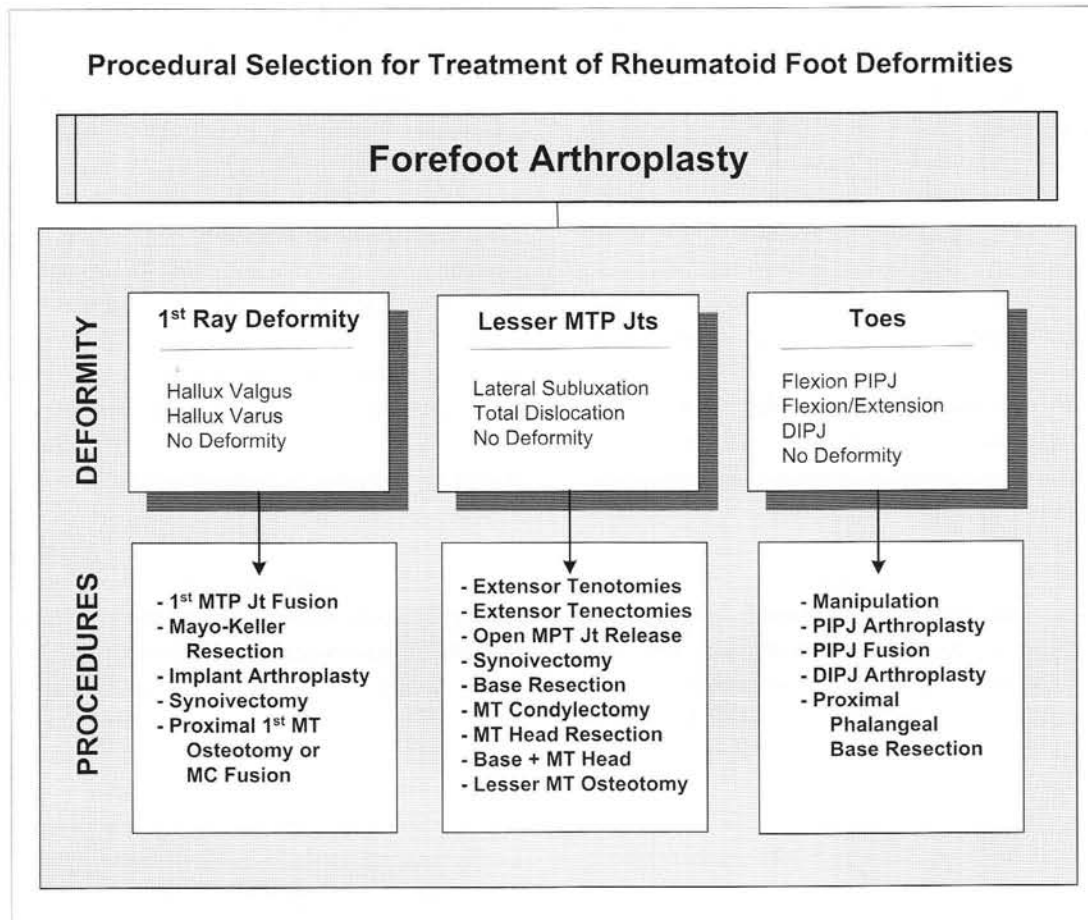|		

- 1st MTP Jt Fusion
- Mayo-Keller
  Resection
- Implant Arthroplasty
- Synoivectomy
- Proximal 1st MT
  Osteotomy or
  MC Fusion
	- Extensor Tenotomies
	- Extensor Tenectomies
	- Open MPT Jt Release
	- Synoivectomy
	- Base Resection
	- MT Condylectomy
	- MT Head Resection
	- Base + MT Head
	- Lesser MT Osteotomy
		- Manipulation
		- PIPJ Arthroplasty
		- PIPJ Fusion
		- DIPJ Arthroplasty
		- Proximal
		  Phalangeal
		  Base Resection

Table 1.

involved the use of the Swanson double-stem hinge silicone implant. For years, this implant has given certainly satisfactory alignment of first MTP joint in elderly individuals. This was verified by the experience of Moeckel et al[37] and their success with hinge silicone implant arthroplasty in rheumatoid forefoot arthroplasty. Over the last decade, frequency of first MTP joint arthrodesis has increased and now considered being "standard" procedure (Figure 4).

First MTP joint arthrodesis has the luxury of reduction of deformity through bone resection but also long-term stabilization of the entire first ray segment. This minimizes recurrence of deformity and biomechanical imbalances postoperatively. A high 1st-2nd intermetatarsal angle has been a problem in the past often requiring additional proximal osteotomy. First MTP joint arthrodesis has been shown to be very effective in the reduction of not only severe first MTP joint deformity but reduction of significant intermetatarsal angles. Arthrodesis even in patients with significant osteopenia can be achieved through modern techniques of osteosynthesis. Arthrodesis has been found to be valuable not only in the typical rheumatoid patients with hallux valgus but also hallux varus. Certainly, there is yet a question of what to do in the patient with little deformity. The decision may depend upon the severity of lesser MTP joint deformity and the need for extensive bony resection.

THE LESSER MTP JOINTS

Probably the greatest variability in the decision-making process of forefoot arthroplasty occurs at the level of the lesser MTP joints. Some joints may have little deformity and/or erosive damage from the rheumatoid disease or very severe dislocations may be present. Although, deformities of the toes and their respective MTP joints are considered as a unit, this discussion will attempt some segregation of the various procedures performed for each. Hammertoe deformities involve contracture of the interphalangeal joints as well as the long and short extensor and flexor tendons as well as the MTP joint.

At times, simply treatment of the MTP joint pathology may allow reduction of the PIPJ segment. This really goes back to the concepts of Kelikian in the 1960s advocating basal resection of the proximal phalanx for hammertoe reduction.[38] In the presence of limited deformity, limited surgery at the MTP joints is
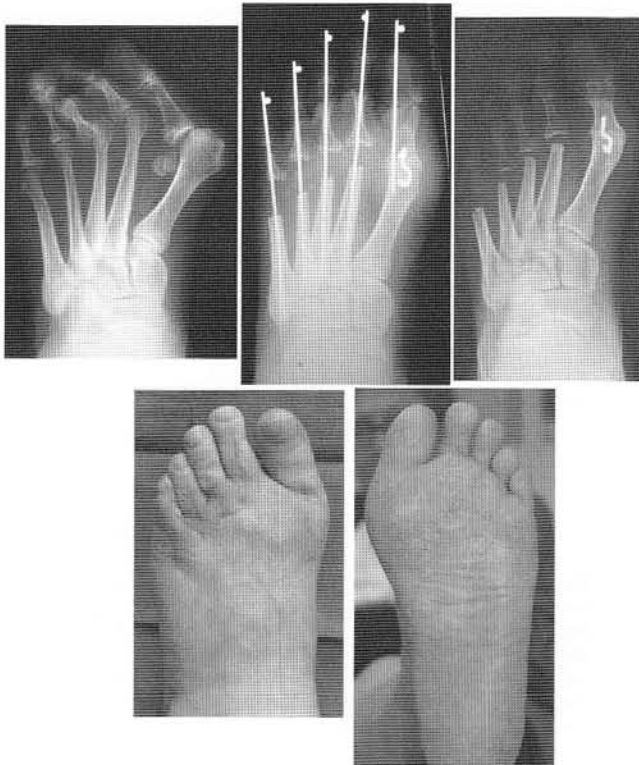
Figure 4. This patient had severe deformity and could not wear standard shoes. Her preoperative AP radiograph (A) illustrates severe luxatory hallux valgus as well as lateral dislocation of the 2nd and 3rd MTP joints. This patient underwent panmetatarsal head resection combined with first MTP joint fusion and lesser toe fusions, (B) AP radiograph at 2 weeks post-op end (C) AP radiograph, one year post-op. Her clinical result at one year post-op (D) and (E) demonstrates maintenance of correction, elimination of metatarsal head plantar prominence and a fine, flat scar following lesser metatarsal head resections through a plantar incisional approach .

recommended. Some toes may involve limited contracture to the extensor tendon contractures and simple tenotomies may be all that is necessary.

The controversy that has gone on for the past 50 years has really been one of where the bone resection of the lesser MTP joints occurs. Is resection of the base of the proximal phalanx and allowance of continued weightbearing on the lesser metatarsal heads advantageous? Or perhaps, is resection of the metatarsal heads most appropriate for eliminating the plantar prominences and associated ulcerative keratoses? At times, deformity may be so severe that resection on both sides of the joint may be necessary. The concept of joint preservation has also been applied to forefoot arthroplasty by Hanyu et al[39] and later Hanson[40] and Dinucci advocating joint release in combination with shortening osteotomy even in the situations where multiple metatarsal osteotomies would be required.

The all or none effect has been the general philosophy with regard to lesser metatarsal head resections. Generally, if one or more of the metatarsal heads require

excision, the more advisable approach has been to excise all four. The exception to this, would be with regard to the fifth metatarsal where metatarsal head resection will yield shortening contracture of the fifth toe but generally does not cause a problem with weight-bearing across the forefoot.

THE TOES

The toes are another area for debate. There are the followers of Clayton and Kelikian, particularly among our orthopedic colleagues, who subscribe to the philosophy that basal resection of the proximal phalanx and relaxing the MTP joint will result in reduction of the hammertoe deformity. Thus in some cases, the simplicity of base resection as well as the limited surgical intervention may be quite attractive. Certainly, much of the early 20th century literature, does describe manipulative reduction of the hammertoe deformity. Base resection with manipulation of the toes as well as Kirschner wire stabilization of the toes and the MTP joints may provide a very nice surgical result.

In more severe deformities, there is no question that some type of arthroplasty or arthrodesis of the toe may be required. Individual toes, just as the individual MTP joints, may show varied involvement. One or two toes may show very severe involvement while relative sparing of the remaining toes is observed. In these such cases, surgical intervention may be limited to one or two toes. Simple post-type resection arthroplasty of the toes with Kirschner wire stabilization across the MTP joints was performed. Deformity may recur and PIPJ fusions are generally recommended. The combination of PIPJ fusion and phalangeal base resection at the MTP joint is also a useful technique.

THE INCISIONAL APPROACH

As witnessed from the prior discussion, the incisional approach to forefoot arthroplasty may be quite varied as numerous anatomic locations require exposure, all of which are on very close proximity. Wound complications and neurovascular embarrassment should be avoided.

The first MTP joint is generally addressed through either a dorsal incision medial to the tendon of extensor hallucis longus or a direct medial approach. The medial first MTP joint incision may be useful as its placement may be more distant from other operative sites involved in the forefoot arthroplasty.

Exposure to the lesser MTP joints may also vary. A dorsal transverse incision generally is not preferred but in the presence of dorsal dislocations of the toes on the

metatarsal heads, a plantar transverse incision may prove expedient and provides excellent exposure. Generally, a plantar excisional skin wedge is not necessary to reduce the anterior advancement of the plantar fat pad. Placement of Kirschner wires retrograded from the tips of the toes across the MTP joints and maintained in this position for six weeks has a very beneficial effect on the plantar fat pad.

Dorsal longitudinal incisions between the 2nd-3rd MTP and 4th-5th MTP joints may be useful. Another approach involves proximal extension of the individual lesser toe longitudinal incisions. This has proved useful particularly in cases where surgical intervention at only the 2nd or 3rd MTP joint is required. Digital arthroplasties may be performed through transverse incisions at the respective IPJ's although in cases of severe fixed deformity, a longitudinal or "flag" incisional approach allows for more atraumatic exposure.

CONCLUSIONS

The forefoot arthroplasty is an extensive surgical intervention involving a significant postoperative morbidity and potential for complications. Good medical management with particular attention to potential adrenal suppression due to chronic corticosteroid use, history of anti-metabolites and history of thromboembolic disease are among the primary concerns bringing the rheumatoid patient to surgery.

We are in the age when extensive foot surgery may be safely performed on an outpatient basis. Even the most complicated procedures of the foot may be performed under local or regional anesthetic blocks in combination with monitored IV sedation. Requirements of pain control, surgery and management of medical conditions such as diabetes and cardiovascular disease may necessitate postoperative hospital admission or at least an overnight stay.

My own experience with forefoot arthroplasty usually combines first MTP joint arthrodesis, lesser metatarsal head resection to a plantar approach and additional digital procedures as necessary has been very rewarding. Nasser and Cracchiolo come to these same conclusions that although these are high risk patients, surgery is generally successful if meticulously planned and carried out.

Most these patients have severe deformities as well as significant preoperative pain and disabilities. Many are unable to wear standard shoes. Postoperatively, these patients feel better almost immediately and are generally enthusiastic following witnessing the transformation of their foot that forefoot arthroplasty provides. Most are able to bear weight on their foot postoperatively with below knee bracing such as a CAM walker. With good surgical technique and limited tourniquet times, wound dehiscence and complications can be expected to be infrequent.

Forefoot arthroplasty has been a very rewarding procedure for both myself as the surgeon as well as for my patients whose foot and sense of well-being is transformed. My quarter decade of experience with forefoot arthroplasty has shown that first MTP joint arthrodesis may be the optimal first MTP joint procedure and has been successfully combined with pan-metatarsal head resections for long-lasting results.

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