

EPIDEMIOLOGY OF ANKLE ARTHRITIS: REPORT OF A CONSECUTIVE SERIES OF 639 PATIENTS FROM A TERTIARY ORTHOPAEDIC CENTER

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ABSTRACT

The purpose of our study was to identify the cause of symptomatic ankle arthritis in a consecutive series of patients presenting in a tertiary care setting. Between 1991 and 2004, 639 patients with Kellgren grade 3 or 4 ankle arthritis presented to the University of Iowa Orthopaedic Foot and Ankle Surgery service. The cause of the arthritis was determined based on medical history, physical examination, and imaging studies. To get a sense of the relative prevalence of the etiologies of lower extremity arthritis in our setting, we evaluated the cause of arthritis of all new patients presenting to the University of Iowa Orthopaedic Department from 1999-2004 with arthritis of the ankle, to those with arthritis of the hip or knee during one year. Of the 639 arthritic ankles, 445 (70%) were post-traumatic, 76 (12%) were rheumatoid disease and 46 (7%) were idiopathic (primary osteoarthritis). The post-traumatic ankle arthritis patients were most commonly associated with past rotational ankle fractures. The majority of ankle arthritis is associated with previous trauma, whereas the primary cause of knee or hip arthritis is idiopathic. Unique strategies to prevent or treat post-traumatic ankle arthritis are needed.

INTRODUCTION

Primary or idiopathic osteoarthritis (OA) is the most common joint disease, and is a significant source of pain and disability for middle-aged and elderly people throughout the world. It occurs rarely in people under

the age of 40. Secondary causes of joint degeneration include dysplasia, inflammatory conditions, traumatic injury, infection, hemophilia and vascular or neurological insults.¹ Primary osteoarthritis is known to occur commonly in the hand, spine, hip and knee. However, it occurs much less frequently in the elbow, shoulder, wrist and ankle.² The reasons for this are not completely understood, but differing anatomical, biomechanical, and biological factors likely contribute to this variability. Primary osteoarthritis is the most common indication for total hip and total knee arthroplasty, whereas post-traumatic arthritis is the most common indication for ankle arthrodesis.

Review of published reports of the treatment of ankle osteoarthritis indicate that primary osteoarthritis in the ankle is rare, and that secondary osteoarthritis that follows rotational ankle fractures or recurrent ligamentous instability is much more common.^{3,4,5,6} Some patients report sustaining no more than a single major ankle sprain, suggesting an undiagnosed chondral injury as the inciting event. The purpose of our study was to identify the cause of symptomatic ankle arthritis in a consecutive series of patients presenting in a tertiary care setting, and to compare the cause of ankle arthritis to that of the hip and knee. The purpose of this subset of data is to report a "snapshot" of a group of patients presenting to the University of Iowa Orthopaedic Department with lower extremity osteoarthritis and to compare the differences between these groups.

METHODS AND RESULTS

Between 1991 and 2004, 639 patients with Kellgren grade 3 or 4 ankle arthritis presented to the University of Iowa Orthopaedic Foot and Ankle Surgery service (Tables 1, 2, and 3). The cause of the arthritis was determined based on medical history, physical examination and imaging studies. Only ankles with Kellgren/Lawrence grade 3 or 4 changes were included. The cause of ankle arthritis was determined whenever possible. If no cause could be elucidated, then by a process of elimination the case was classified as primary osteoarthritis.

In addition, during a one-year period (April 1998-March 1999) we collected data on patients who pre-

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TABLE 1
All ankle arthritis patients
presenting to the University of Iowa
Orthopaedics Department

Type	No.	% of total	Avg. Age	SD Age
Septic	10	1.6	56.7	16.94
Rheumatoid	76	11.9	58.7	12.6
Osteonecrosis	14	2.2	49.5	14.91
Neuropathic	31	4.9	53.8	13.95
Hemophilic	12	1.9	24.3	16.86
Gout	5	0.8	46.0	18.1
Primary	46	7.2	67.2	12.4
Post-traumatic	445	70.0	51.5	14.4
	639			

September 1991 to August 2004

TABLE 2
Subset with post-traumatic ankle arthritis

Causes	No.	% of total	Avg. Age	SD Age
Tibial and fibular shaft	18	4.0	54.9	11.5
Tibia fracture	38	8.5	49	16.3
Plafond fracture	40	9.0	43.1	11.5
Rotational ankle	164	37.0	50.8	14.2
Talar fracture	38	8.3	46.9	14.5
Osteochondritis dissecans	21	4.7	44.6	12.62
Recurrent ankle instability	65	14.6	57.7	13.29
Single sprain with cont'd pain	61	13.7	50	16.17
	445			

sented to all of the University of Iowa Orthopaedic clinics with symptomatic Kellgren grade 3 or 4 arthritis of the hip, knee or ankle (Table 4).

DISCUSSION

The majority of clinical and basic science research has focused on hip and knee osteoarthritis. The ankle joint has received relatively less attention. Ankle osteoarthritis has characteristics that distinguish it from osteoarthritis occurring in other joints, resulting in differences in prevalence, clinical presentation, natural history and possibly even response to treatment. This study is one of the first to characterize the epidemiology of ankle arthritis.

The ankle joint possesses unique epidemiological, anatomic, biomechanical and biologic characteristics when compared to other joints in the lower extremity. While primary hip and knee arthritis is common, ankle arthritis has been characterized as usually secondary, and the result of another initiating event or underlying

TABLE 3
Subset with primary ankle arthritis

Causes	No.	% total
Congenital foot deformity	7	15
Planovalgus foot	6	13
Cavovarus foot	10	22
No foot deformity	23	50

(N=46)

TABLE 4
Demographics of lower extremity arthritis
in the hip, knee and ankle

	Hips	Knees	Ankles
Total	167	424	48
Primary	109 (65%)	347 (82%)	9 (19%)
Post-traumatic	14 (8%)	53 (12.5%)	26 (54%)
Rheumatoid	3 (2%)	15 (3.5%)	7 (14.6%)
Neuropathic	0	3 (0.7%)	3 (6%)
Dysplastic	18 (11%)	2 (0.5%)	3 (6%)
Avascular Necrosis	18 (11%)	2 (0.5%)	0
Other	5 (3%)	2 (0.5%)	1 (2%)

(N=639 total)

April 1998 to March 1999

pathologic process.⁷ These differences are supported by our data.

Ankle articular cartilage is different from that of the hip and knee in several ways. The anatomy and motion characteristics of the ankle joint are unique and the ankle has a much smaller articular surface area than the hip or knee. Ankle articular cartilage is thinner (1-2mm) and better preserves its tensile stiffness and fracture stress with aging than hip articular cartilage. There are also metabolic differences between ankle and knee articular cartilage that may also help explain the relative rarity of primary ankle osteoarthritis. All of these differences may protect the ankle from developing primary osteoarthritis.⁸

Studying the prevalence of osteoarthritis is fraught with limitations and biases. Our data is limited in that our sample was gathered from patients presenting to a tertiary orthopaedic department with complaints of ankle pain, thus limiting the generalizability of our data. This approach has been used by others working in tertiary rheumatology clinics by Cushnaghan and Dieppe,² and allows a sample of convenience.

Despite these limitations, our data helps define the etiology of ankle arthritis in the largest consecutive, unselected series of patients published. The prevalence

of primary osteoarthritis in our sample was only 7.2%, and half of these patients had substantial malalignment of the hindfoot, predisposing the ankle joint to eccentric wear and degenerative disease. The data further suggests that the proper alignment and function of the subtalar joint remains crucial in the proper long-term durability of the human ankle.

Previous reports suggest that trauma is the most common cause of ankle osteoarthritis; this is supported by our data (70%). Among the prevalent sub-causes are recurrent ankle sprains and a single ankle sprain with continued pain. The former suggests the absolutely critical importance of spatially well-distributed loading of cartilage, whereas the latter likely represents unrecognized full-thickness cartilage injury. The differences in the causes of lower limb arthritis are striking. The one-year data also shows a much higher percentage of post-traumatic ankle osteoarthritis (54%) as compared to the hip (8%), and the knee (12.5%).

In conclusion, arthritis of the ankle is unique compared to the other major lower extremity arthritides. The relatively young average age of presentation of painful, post-traumatic ankle OA to our tertiary center is concerning because of the lack of available long-lasting treatments. Future research is needed in order to help better understand the prevention and treatment of ankle OA, particularly in light of the burden of this disease to society and the health system.⁹

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