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Discrepancy between Radiographic and Arthroscopic Findings of Thumb Basilar Joint Arthritis: A Preliminary Clinical Report

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Background: The radiographic staging of arthritic changes in the thumb carpometacarpal (CMC) joint is known to have poor correlation with pain level. This may be due to the limited ability of radiographs to evaluate degenerative changes. The purpose of this study was to examine the relationship between radiographic versus arthroscopic findings of thumb CMC and scaphotrapeziotrapezoidal (STT) joint arthritis.

Methods: Twenty patients with symptomatic thumb CMC arthritis underwent arthroscopy of thumb CMC and STT joints with concomitant synovectomy or arthroplasty depending on the degree of articular degeneration found. All patients had preoperative radiographs of the thumb CMC and STT joints. Radiographic degeneration was graded based on the Eaton-Glickel classification. Intraoperative arthroscopic images were reviewed and graded based on the Brown grading system.

Results: At the thumb CMC joint, five patients had discordant radiographic and arthroscopic findings of arthritis. At the STT joint, one patient had discordant radiographic and arthroscopic findings of arthritis.

Conclusions: In comparing the two staging systems, we found a small subset of patients that demonstrated significant discrepancies. Clinical evaluation remains essential, and patients should be informed that radiographs may underestimate the actual severity of arthritis. *(Plast Reconstr Surg Glob Open 2023; 11:e4877; doi: 10.1097/GOX.0000000000004877; Published online 13 March 2023.)*

INTRODUCTION

Osteoarthritis of the thumb basilar joint, also known as the carpometacarpal (CMC) joint, is a common cause of hand pain and dysfunction. The radiographic prevalence of thumb basilar joint arthritis is strongly correlated with age and has been found to increase steadily in patients older than 41 years, reaching a prevalence of 91% in patients older than 80 years.[1]

The amount of pain caused by thumb basilar joint arthritis can be extremely variable, and radiographic severity has not been found to reliably predict disability.[2] This brings into question the ability of radiographs to predict actual joint degeneration, especially in patients who report severe symptoms but have little radiographic evidence of arthritis.

To our knowledge, the relationship between the radiographic findings of arthritis to the actual degree of articular cartilage degeneration within the thumb basilar joint has not been evaluated. Thus, our objective is to report on a series of patients who described symptoms of thumb basilar joint arthritis and had available for review both radiographs and arthroscopic images of their thumb CMC joints.

MATERIALS AND METHODS

Institutional review board approval was obtained for this report. A retrospective review was performed of patients at our institution who between July 1, 2020 and December 31, 2020 described symptoms of thumb basilar joint arthritis and had radiographs obtained and arthroscopy performed as part of their care. All patients had radiographs consisting of posteroanterior, lateral,

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Table 1. Radiographic Grading System

Stage	Findings
1	Normal joint
2	Slight joint-space narrowing, sclerosis
3	Marked joint-space narrowing, osteophytes < 2 mm
4	Osteophytes ≥ 2 mm, subchondral cysts, ankylosis

and Robert views of the thumb. Patients with severe symptoms deemed appropriate candidates for surgical intervention were offered arthroscopy (Arthrex NanoScope, Naples, Fla.) for intraoperative evaluation of the thumb CMC and scaphotrapeziotrapezoidal (STT) joints with concomitant basilar joint interposition arthroplasty with meniscus allograft (senior author's preferred technique) versus arthroscopic synovectomy depending on the degree of articular degeneration found and the patient's preference for invasiveness of procedure. Preoperative radiographs were reviewed, and degeneration at the thumb CMC and STT joints was graded according to a system modified from the original Eaton and Glickel classification scheme (Table 1).[3] Intraoperative arthroscopic images were reviewed and graded according to a system described by Brown et al (Table 2).[4] As the data obtained were descriptive in nature, statistical analysis was not performed.

RESULTS

Twenty patients had radiographs and arthroscopic images of their thumb basilar joints available for review (Table 3). The average age of our patients was 62 years. Thirteen patients were women and seven were men.

At the thumb CMC joint, all 20 patients demonstrated some degree of arthritis when examined arthroscopically (arthroscopic stage 2 or higher). However, in five of these patients (25%), radiographs showed no signs of degeneration (radiographic stage 1; Figs. 1 and 2). The remainder of patients had some degree of both radiographically and arthroscopically visualized cartilage degeneration. None of the patients had arthroscopic staging that was less advanced than radiographic staging. Cumulatively at the CMC joint, the average radiographic stage was 2.75 and the average arthroscopic stage was 3.65.

At the STT joint, in one patient, radiographs showed no signs of degeneration (radiographic stage 1), whereas arthroscopic findings showed progressive cartilage degeneration (arthroscopic stage 3). The remainder of patients had concordant radiographic and arthroscopic findings. Cumulatively at the STT joint, the average radiographic stage was 1.3 and the average arthroscopic stage was 1.5.

Table 2. Arthroscopic Grading System

Stage	Findings
1	Normal cartilage: smooth, shiny, intact surfaces
2	Early cartilage degeneration: surface fibrillation, minor surface pitting
3	Progressive cartilage degeneration: deep surface pitting, fissures, clefts, surface blistering, exposed bone
4	End-stage cartilage degeneration: eburnated bone

Takeaways

Question: Is there a relationship between radiographic and arthroscopic findings of thumb carpometacarpal and scaphotrapeziotrapezoidal joint arthritis?

Findings: In comparing radiographic and arthroscopic findings of thumb carpometacarpal and scaphotrapeziotrapezoidal arthritis, we found a small subset of patients that demonstrated significant discrepancies.

Meaning: Imaging methods more sensitive than standard radiography may be needed to define the presence and severity of thumb basilar joint arthritis.

DISCUSSION

Eaton and Glickel described a classification system for thumb basilar joint arthritis based on radiographic parameters.[3] Although widely used, the intra- and interobserver reliability of this system have been shown to be poor.[5] Furthermore, the radiographic severity of thumb basilar joint arthritis has not been found to correlate with severity of symptoms.[2] Altogether, this brings into question the ability of radiographs to predict the severity of actual cartilage degeneration at the thumb CMC joint. Despite these uncertainties, treatment recommendations are often made based on radiographic findings in conjunction with symptoms on clinical examination.[6] However, this becomes challenging in patients who report severe symptoms of thumb basilar joint arthritis despite having limited radiographic evidence of such. In these patients, if the etiology of the pain is indeed arthritis and not another entity such as ligamentous laxity, radiographic findings may underappreciate the amount of cartilage degeneration present within the joint.

To our knowledge, this is the first time that the relationship between radiographic and arthroscopic findings of thumb CMC arthritis has been investigated. Although all 20 patients were found on arthroscopy to have some degree of visible cartilage degeneration, five of these 20 patients had unremarkable radiographs. This would suggest that methods more sensitive than radiography are needed to define the presence and severity of thumb CMC arthritis.

In one of our patients, significant STT arthritis was found arthroscopically despite no evidence of such condition noted radiographically. This result concurs with previous studies that have demonstrated that radiography tends to underestimate the actual severity of arthritis at the STT joint.[4,7] This finding underscores the importance of gross examination of the STT joint at the time of CMC arthroplasty surgery so that the STT joint can be addressed concurrently.

There are several limitations to this study. As a small retrospective case series, definitive quantifiable conclusions

Table 3. Radiographic and Arthroscopic Stages, and Procedures Performed

Patient	CMC Radiographic Stage	CMC Arthroscopic Stage	STT Radiographic Stage	STT Arthroscopic Stage	Procedure
1	1	3	3	3	CMC Synovectomy
2	1	3	1	1	CMC Arthroplasty
3	1	2	1	1	CMC Synovectomy
4	1	4	1	2	CMC Arthroplasty
5	1	3	1	1	CMC Synovectomy
6	2	4	1	1	CMC Arthroplasty
7	2	4	2	2	CMC Arthroplasty
8	3	4	1	1	CMC Arthroplasty
9	3	4	1	3	CMC Arthroplasty
10	3	4	1	1	CMC Arthroplasty
11	3	3	1	1	CMC Arthroplasty
12	3	4	1	2	CMC Arthroplasty
13	3	3	1	1	CMC Arthroplasty
14	4	4	2	1	CMC Arthroplasty
15	4	4	1	1	CMC Arthroplasty
16	4	4	1	1	CMC Arthroplasty
17	4	4	1	1	CMC Arthroplasty
18	4	4	1	1	CMC Arthroplasty
19	4	4	2	2	CMC Arthroplasty
20	4	4	2	3	CMC Arthroplasty

Fig. 1. Radiographs of a patient with symptomatic thumb CMC arthritis. (A) Posteroanterior, (B) lateral, and (C) Robert radiographic views showing unremarkable degenerative changes at the thumb CMC.

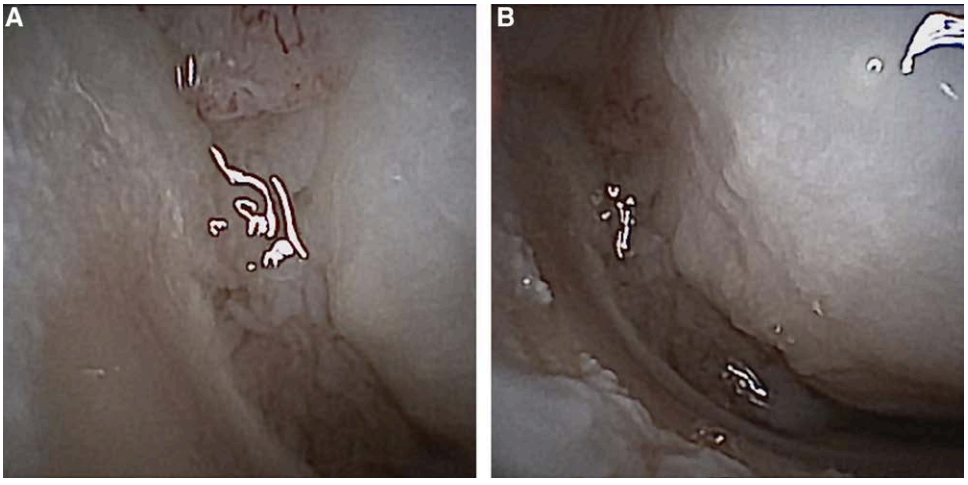

Fig. 2. Arthroscopic images of the thumb CMC in the same patient demonstrating (A) full-thickness chondral defect at the trapezium and (B) surface blistering at the metacarpal base.

cannot be made. Additionally, there is selection bias as the decision to offer surgery and arthroscopy was based on physician discretion and judgement that the symptoms were severe enough to warrant such treatment. As such, our findings are best interpreted as general observations that warrant further investigation.

CONCLUSIONS

In conclusion, the results of this study suggest that radiographic findings of thumb basilar joint arthritis may underestimate the amount of actual cartilage degeneration within the joint. Imaging methods more sensitive than standard radiography may be needed to define the presence and severity of thumb basilar joint arthritis. Future prospective trials with larger sample sizes and calculation of correlation coefficients will be required to quantify the relationship more definitively between radiographic and arthroscopic findings of thumb basilar joint arthritis. Ultimately, these results are a reminder that patients with normal appearing radiographs should not be discounted as they may still have severe arthritis and need treatment, and that the clinical examination remains essential in guiding treatment recommendations.

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REFERENCES

1. Sodha S, Ring D, Zurakowski D, et al. Prevalence of osteoarthrosis of the trapeziometacarpal joint. *J Bone Joint Surg Am.* 2005;87:2614–2618.
2. Haara MM, Heliövaara M, Kröger H, et al. Osteoarthritis in the carpometacarpal joint of the thumb. Prevalence and associations with disability and mortality. *J Bone Joint Surg Am.* 2004;86:1452–1457.
3. Eaton RG, Glickel SZ. Trapeziometacarpal osteoarthritis. Staging as a rationale for treatment. *Hand Clin.* 1987;3:455–471. PMID
4. Brown GD, III, Roh MS, Strauch RJ, et al. Radiography and visual pathology of the osteoarthritic scaphotrapezio-trapezoidal joint, and its relationship to trapeziometacarpal osteoarthritis. *J Hand Surg Am.* 2003;28:739–743.
5. Berger AJ, Momeni A, Ladd AL. Intra- and interobserver reliability of the Eaton classification for trapeziometacarpal arthritis: a systematic review. *Clin Orthop Relat Res.* 2014;472:1155–1159.
6. Van Heest AE, Kallemeier P. Thumb carpal metacarpal arthritis. *J Am Acad Orthop Surg.* 2008;16:140–151.
7. Glickel SZ, Kornstein AN, Eaton RG. Long-term follow-up of trapeziometacarpal arthroplasty with coexisting scaphotrapezial disease. *J Hand Surg Am.* 1992;17:612–620.