# The Reduction Maneuver is More Accurate than the Grind or Shift Tests for Diagnosing Thumb Basal Joint Arthritis

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## Background

Recent evidence suggests variation in the diagnostic utility of different provocative maneuvers for thumb base arthritis. [1,2]

## Purpose

We sought to **compare** the accuracy of the **three** most common provocative **tests**
1.) **Grind** test
2.) **Shift** test
3.) **Reduction** maneuver
when examining patients for **thumb** basal joint **arthritis**.

## Material and Methods

### Subjects:

Patients evaluated by a single provider for symptomatic **thumb** basal joint **arthritis** from **2011-2015** were identified from an institutional database. **Charts** were **reviewed** for results of **provocative tests** (*grind*, *shift*, *reduction*) and classified as **positive if they elicited pain**. Five surgeons blindly scored radiographs, and the median **Eaton stage** for each hand was used for comparison. Tests were also performed on asymptomatic control subjects.

### Statistical Analysis:

McNemar's test was calculated for each provocative test; Cohen's kappa was used to define the agreement between each test and the diagnosis of thumb basal joint arthritis.

## Provocative Tests

**Figure 2. Grind test.** The examiner applies axial loading to the subjects thumb and then flexes, extends and **circumducts** the thumb.



**Figure 3. Shift test.** The examiner applies pressure to the radial aspect of the thumb to shift the base of the metacarpal in an **ulnar** direction compared to the trapezium.



**Figure 4. Reduction manduever.** The examiner applies a **volarly** directed pressure on the base of the metacarpal to reduce the metacarpal from its dorsally subluxed position.



## Results

**Table 1.** Characteristics of Patient Population

| Characteristic | Study Population, N (%) | Control Population |
|---|---|---|
| **Study cohort** | | |
| Total thumbs | 48 | 12 |
| Unique patients | 37 (77%) | 6 (50%) |
| Bilaterals | 11 (23%) | 12 (100%) |
| **Gender** | | |
| Male | 12 (25%) | 1 (8%) |
| Female | 36 (75%) | 5 (92%) |
| **Age** | | |
| Mean ± SD (range) | 65.6 ± 9.7 (35 – 101) | 50.2 ± 9.0 (33 – 59) |
| <40 | 1 (2%) | 2 (17%) |
| 41 – 65 | 25 (52%) | 10 (83%) |
| >65 | 22 (46%) | 0 (0%) |
| **Handedness** | | |
| Right | 40 (83%) | 10 (83%) |
| Left | 5 (10%) | 2 (17%) |
| Missing | 3 (7%) | |
| **Pain Laterality** | | |
| Right | 23 (48%) | NA |
| Left | 25 (52%) | |
| **Grind test** | | |
| Negative | 34 (71%) | 11 (92%) |
| Positive | 14 (29%) | 1 (8%) |
| **Shift test** | | |
| Negative | 34 (71%) | 11 (92%) |
| Positive | 13 (27%) | 1 (8%) |
| Missing | 1 (2%) | |
| **Reduction maneuver** | | |
| Negative | 9 (19%) | 12 (100%) |
| Positive | 39 (81%) | 0 (0%) |
| **Eaton stage (averaged)** | | |
| Mean ± SD (range) | 2.9 ± 0.7 (1.6 – 4) | |
| 1-2 | 6 (13%) | NA |
| 2-3 | 18 (38%) | |
| 3-4 | 15 (31%) | |
| missing x-ray | 9 (19%) | |

Thirty-seven patients (48 thumbs) were identified in the experimental group. The median Eaton stage was 3. *Grind*, *shift*, and *reduction* were positive in **29%**, **27%** and **81%** of subjects (p<0.001). Sensitivity, specificity, positive predictive value and negative predictive value were higher for *reduction* compared to *grind* and *shift*. Each test was separately evaluated for accuracy in diagnosing thumb basal joint arthritis (**Table 1.**). *Grind, shift*, and *reduction* were positive more often in patients with arthritis than in control subjects (McNemar's *p<0.001*, *p<0.001*, and *p=0.004*, respectively). However, there was a poor level of agreement for having arthritis and a positive *grind* or *shift* (*k=0.103, p=0.13* and *k=0.095, p=0.16*, respectively), but a substantial level of agreement for *reduction* (*k=0.634, p<0.001*). There was a 100% correlation between obtaining a positive *shift* or *grind* and a positive *reduction* (*p<0.001* and *p<0.001*, respectively), indicating that if the *grind* or *shift* is positive the *reduction* will also be positive.

**Table 2.** Sensitivity, Specificity and predictive values of the grind, shift and reduction tests

| | | | | Se | Sp | PPV | NPV |
|---|---|---|---|---|---|---|---|
| **Grind Test** | | | | | | | |
| Symptoms | positive | negative | total | | | | |
| **Positive** | 13 (TP) | 26 (FN) | 39 | | | | |
| **Negative** | 1 (FP) | 11 (TN) | 12 | | | | |
| total | 14 | 37 | | 33 | 92 | 93 | 30 |
| **Shift Test** | | | | | | | |
| **Positive** | 11 (TP) | 27 (FN) | 38 | | | | |
| **Negative** | 1 (FP) | 11 (TN) | 12 | | | | |
| total | 12 | 38 | | 29 | 92 | 92 | 29 |
| **Reduction Maneuver** | | | | | | | |
| **Positive** | 32 (TP) | 7 (FN) | 39 | | | | |
| **Negative** | 0 (FP) | 12 (TN) | 12 | | | | |
| total | 32 | 19 | | 82 | 100 | 100 | 63 |

**Table 3.** Comparison of positive tests by stage

| | Percentage of Positive Exam by Arthritis Stage | | | |
|---|---|---|---|---|
| | I | II | III | IV |
| **Grind Test** | 0% | 20% | 33% | 50% |
| **Shift Test** | 0% | 33% | 20% | 41% |
| **Reduction Maneuver** | 100% | 70% | 86% | 92% |

**Figure 1.** (**a.**) **Eaton stage I** (**b.**) **Eaton stage II** (**c.**) **Eaton stage III** and (**d.**) **Eaton stage IV** osteoarthritis of the 1st CMC joint.

**REFERENCES**
1. Gelberman RH. Trapeziometacarpal Arthritis: A Prospective Clinical Evaluation of the Thumb Adduction and Extension Provocative Tests. J Hand Surg Am. 2015 Jul.
2. Choa RM. A Prospective case-control study to compare the sensitivity and specificity of the grind and traction-shift tests in osteoarthritis of the thumb carpometacarpal joint. J Hand Surg Eur Vol. 2014 Mar.

## Conclusions

- The **reduction** maneuver is a more accurate test for diagnosing thumb basal joint arthritis than the **grind** or **shift** test.
- **Grind** or **shift** tests are more likely to be positive in higher stages of arthritis, but do not reliably make the correct diagnosis. *Reduction* was highly accurate regardless of stage.
- **Reduction** maneuver was appropriately positive in every case in which **grind** or **shift** tests also elicited pain.