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ISAKOS CONGRESS 2023

Boston Massachusetts June 18 - June 21

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# MATERIAL AND METHODS

**DESIGN:** cross-sectional descriptive study by reviewing data obtained from the surgical notes of the last 20 years (2002-2021) from patients who underwent arthroscopic knee surgery in a private center specialized in knee arthroscopy.

**INCLUSION CRITERIA:**

- Patients subjected to primary meniscal surgery.

**EXCLUSION CRITERIA:**

- Patients with previous surgery on the same knee
- All the tears prior to 2002 were discarded to establish a long-term but still modern starting point.

# MATERIAL AND METHODS

**VARIABLES:**

- Age (measured in years and stratified in 4 groups for comparative purposes: 0-15 years, 16-30, 31-45 and >45, sex (male or female), knee (right or left), meniscus (medial or lateral)

- Tissue quality (i.e., degenerative or nondegenerative; all DMT were considered as complex) was registered, as well as the presence of accompanying injuries.

- **Morphology of the meniscal tear** (longitudinal, horizontal, radial, flap, root avulsion, ramp lesion or complex), **radial location** (zone 1: periphery; zone 2: middle third; zone 3: free edge) and **location on the axial plane** (anterior horn, middle third, posterior horn, or miscellaneous segments of the meniscus)

- **Repairable tears** were those longitudinal in zones 1 and 2, ramp lesions, root avulsions (except those with very degenerative tissue) and those radial and horizontal in zone 1. Other types of meniscal tear were only considered repairable when they were repaired.

# MATERIAL AND METHODS

**VARIABLES:**

- All the variables described were compiled in a model specifically designed for knee arthroscopy, similar to the model published by the Meniscal Documentation Committee of ISAKOS (7). The treatment performed was also recorded.

- All the characteristics were extracted from a database built in a Microsoft Excel 2010 spreadsheet (Microsoft, Redmond, WA), which was anonymized by a person not related with the study.

- The review of the data was performed by a single orthopedic surgeon, specialized in arthroscopic knee surgery.

# RESULTS

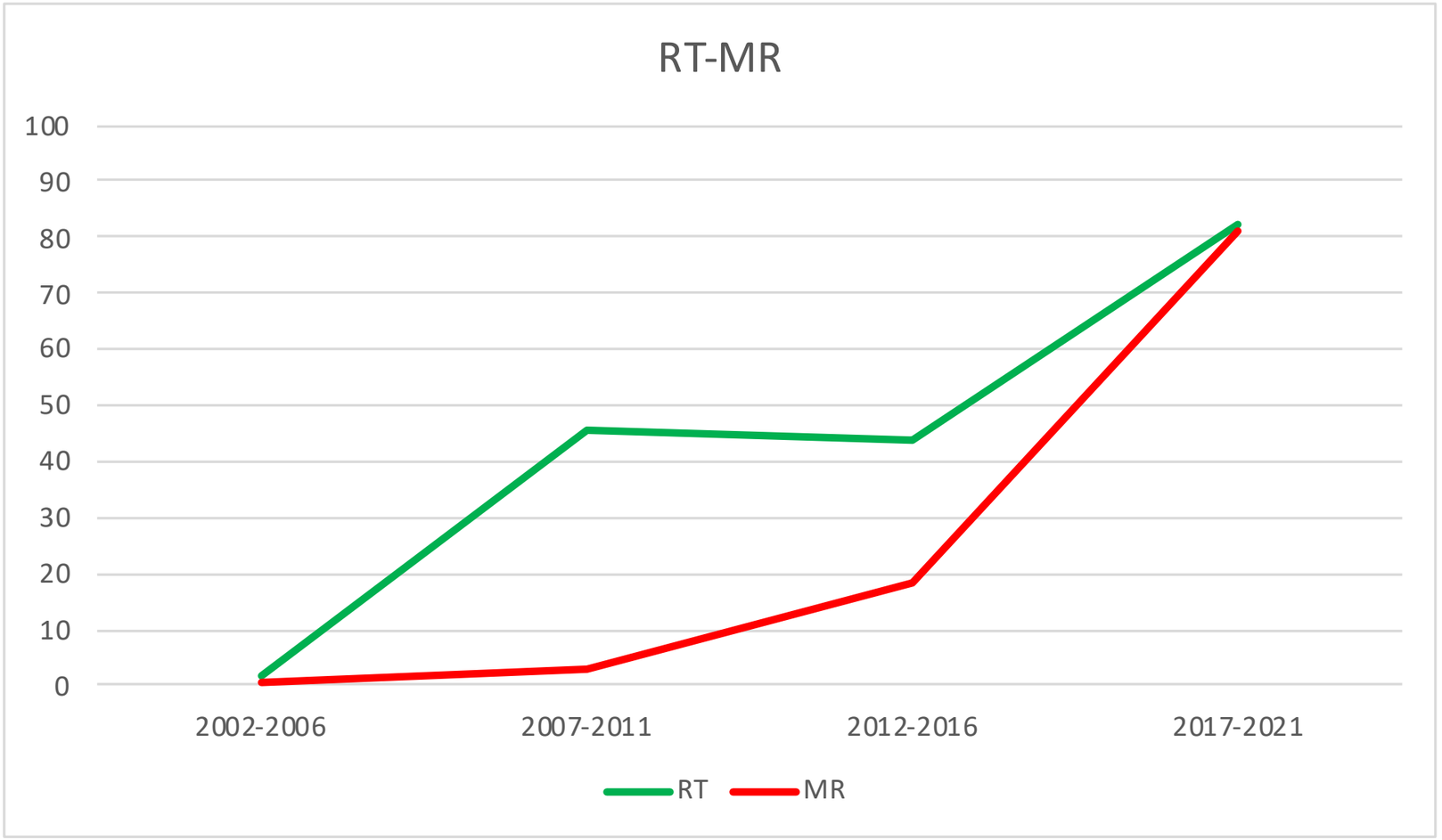


Diagram showing the evolution of repairable meniscal tears (RT) found during knee arthroscopy in the last 20 years and the evolution of the meniscal repairs performed (MR)

# RESULTS

## Table 1. Evolution of arthroscopic findings according to the repairability of the meniscal tear

| DATE | REPAIR. | SEX (%) | | | AGE (%) | | | | | KNEE (%) | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | MALE | FEMALE | P value | <16 | 16-30 | 31-45 | >45 | P value | RIGHT | LEFT | P value |
| 2002-2006 | RT | 4 (2.2) | 0 (0) | .248 | 1 (25) | 1 (4.5) | 2 (1.8) | 0 (0) | .001 | 2 (1.6) | 2 (1.7) | .967 |
| | NRT | 182 (97.8) | 61 (100) | | 3 (75) | 21 (95.5) | 108 (98.2) | 111 (100) | | 124 (98.4) | 119 (98.3) | |
| 2007-2011 | RT | 202 (49.9) | 46 (32.2) | <.001 | 6 (54.5) | 114 (79.2) | 86 (38.9) | 42 (24.4) | <.001 | 123 (44.2) | 125 (46.3) | .630 |
| | NRT | 203 (50.1) | 97 (67.8) | | 5 (45.5) | 30 (20.8) | 135 (61.1) | 130 (75.6) | | 155 (55.8) | 145 (53.7) | |
| 2012-2016 | RT | 190 (40.8) | 65 (55.6) | .004 | 13 (61.9) | 135 (52.1) | 94 (39) | 13 (21) | <.001 | 138 (44.4) | 117 (43) | .742 |
| | NRT | 276 (59.2) | 52 (44.4) | | 8 (38.1) | 124 (47.9) | 147 (61) | 49 (79) | | 173 (55.6) | 155 (57) | |
| 2017-2021 | RT | 311 (82.7) | 112 (81.2) | .683 | 23 (95.8) | 195 (95.6) | 160 (81.2) | 45 (50.6) | <.001 | 244 (80.3) | 179 (85.2) | .146 |
| | NRT | 65 (17.3) | 26 (18.8) | | 1 (4.2) | 9 (4.4) | 37 (18.8) | 44 (49.4) | | 60 (19.7) | 31 (14.8) | |

Repair.: Repairability; RT: Repairable meniscus Tear; NRT: Non-Repairable meniscus Tear.

MED.: medial; LAT.: lateral; Misc: miscellaneous regions affected. AH: anterior horn; MT: Middle third; PH: posterior horn; COMP.: complex; LONG.: longitudinal; HORIZ.: Horizontal

| DATE | REPAIR. | MENISCUS (%) | | | ZONE (%) | | | | REGION (%) | | | | | TYPE OF TEAR (%) | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | MED. | LAT. | P val. | 1 | 2 | 3 | P val. | MISC. | AH | MT | PH | P val. | COMP. | LONG. | FLAP | RADIAL | HORIZ. | ROOT | RAMP | P val. |
| 2002-2006 | RT | 3 (1.8) | 1 (1.3) | .763 | 3 (4.3) | 1 (0.8) | 0 (0) | <.001 | 0 (0) | 0 (0) | 4 (11.4) | 0 (0) | <.106 | 0 (0) | 2 (13.3) | 0 (0) | 2 (6.7) | 0 (0) | | | <.001 |
| | NRT | 165 (98.2) | 78 (98.7) | | 67 (95.7) | 128 (99.2) | 48 (100) | | 60 (100) | 13 (100) | 31 (88.6) | 139 (100) | | 151 (100) | 13 (86.7) | 42 (100) | 28 (93.3) | 9 (100) | | | |
| 2007-2011 | RT | 165 (47.1) | 83 (41.9) | .238 | 197 (69.1) | 51 (25.6) | 0 (0) | <.001 | 104 (56.5) | 11 (36.7) | 6 (14) | 127 (43.6) | <.001 | 5 (2.6) | 201 (91.4) | 0 (0) | 29 (40.3) | 10 (71.4) | 3 (50) | | <.001 |
| | NRT | 185 (52.9) | 115 (58.1) | | 88 (30.9) | 141 (74.4) | 71 (100) | | 80 (43.5) | 19 (63.3) | 37 (86) | 164 (56.4) | | 189 (97.4) | 19 (8.6) | 42 (100) | 43 (59.7) | 4 (28.6) | 3 (50) | | |
| 2012-2016 | RT | 171 (62.4) | 84 (27.2) | .<.001 | 172 (63) | 82 (37.8) | 1 (1.1) | <.001 | 76 (51.4) | 8 (26.7) | 7 (9.9) | 164 (49.1) | <.001 | 7 (3.7) | 219 (94) | 0 (0) | 13 (15.5) | 8 (40) | 7 (58.3) | 1 (100) | <.001 |
| | NRT | 103 (37.6) | 225 (72.8) | | 101 (37) | 135 (62.2) | 92 (98.9) | | 72 (48.6) | 22 (73.3) | 64 (90.1) | 170 (50.9) | | 180 (96.3) | 14 (6) | 46 (100) | 71 (84.5) | 12 (60) | 5 (41.7) | 0 (0) | |
| 2017-2021 | RT | 271 (83.1) | 152 (80.9) | .515 | 351 (94.1) | 71 (56.3) | 1 (6.7) | <.001 | 55 (80.9) | 7 (43.8) | 13 (48.1) | 348 (86.4) | <.001 | 43 (42.2) | 288 (98.3) | 2 (11.8) | 19 (70.4) | 9 (100) | 52 (98.1) | 13 (100) | <.001 |
| | NRT | 55 (16.9) | 36 (19.1) | | 22 (5.9) | 55 (43.7) | 14 (93.3) | | 13 (19.1) | 9 (56.3) | 14 (51.9) | 55 (13.6) | | 59 (57.8) | 5 (1.7) | 15 (88.2) | 8 (29.6) | 0 (0) | 1 (1.9) | 0 (0) | |

# RESULTS

## Table 2. Evolution of arthroscopic findings according to the treatment performed on meniscal tears

| DATE | TREAT. | SEX (%) | | | AGE (%) | | | | | KNEE (%) | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | MALE | FEMALE | P value | <16 | 16-30 | 31-45 | >45 | P value | RIGHT | LEFT | P value |
| 2002-2006 | APM | 147 (79) | 40 (65.6) | .074 | 3 (75) | 14 (63.6) | 92 (83.6) | 78 (70.3) | <.001 | 100 (79.4) | 87 (71.9) | .204 |
| | MR | 1 (0.5) | 0 (0) | | 1 (25) | 0 (0) | 0 (0) | 0 (0) | | 1 (0.8) | 0 (0) | |
| | Other | 38 (20.5) | 21 (34.4) | | 0 (0) | 8 (36.4) | 18 (16.4) | 33 (29.7) | | 25 (19.8) | 34 (28.1) | |
| 2007-2011 | APM | 373 (92.1) | 128 (89.5) | .443 | 7 (63.6) | 126 (87.5) | 208 (94.1) | 160 (93) | <.001 | 254 (91.4) | 247 (91.5) | .768 |
| | MR | 11 (2.7) | 5 (3.5) | | 3 (27.3) | 6 (4.2) | 3 (1.4) | 4 (2.3) | | 11 (3.9) | 5 (1.8) | |
| | Other | 21 (5.2) | 10 (7) | | 1 (9.1) | 12 (8.3) | 10 (4.5) | 8 (4.7) | | 13 (4.7) | 18 (6.7) | |
| 2012-2016 | APM | 349 (74.9) | 76 (65) | .136 | 9 (42.9) | 172 (66.4) | 187 (77.6) | 57 (91.9) | <.001 | 216 (69.5) | 209 (76.8) | .300 |
| | MR | 78 (16.7) | 30 (25.6) | | 10 (47.6) | 68 (26.3) | 29 (12) | 1 (1.6) | | 63 (20.3) | 45 (16.6) | |
| | Other | 39 (8.4) | 11 (9.4) | | 2 (9.5) | 19 (7.3) | 21 (10.4) | 4 (6.5) | | 32 (10.2) | 18 (6.6) | |
| 2017-2021 | APM | 64 (17) | 27 (19.6) | .830 | 1 (4.2) | 8 (3.9) | 36 (18.3) | 46 (51.7) | <.001 | 60 (19.7) | 31 (14.8) | .215 |
| | MR | 307 (81.7) | 111 (80.4) | | 23 (95.8) | 194 (95.1) | 158 (80.2) | 43 (48.3) | | 241 (79.3) | 177 (84.3) | |
| | Other | 5 (1.3) | 0 (0) | | 0 (0) | 2 (1) | 2 (1.5) | 0 (0) | | 3 (1) | 2 (0.9) | |

TREAT.: Treatment; APM: Arthroscopic partial meniscectomy; MR: Meniscal repair; Other: other conservative treatments different from repair.

MED.: medial; LAT.: lateral; Misc: miscellaneous regions affected. AH: anterior horn; MT: Middle third; PH: posterior horn; COMP.: complex; LONG.: longitudinal; HORIZ.: Horizontal

| DATE | TREAT. | MENISCUS (%) | | | ZONE (%) | | | | REGION (%) | | | | | TYPE OF TEAR (%) | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | MED. | LAT. | P val. | 1 | 2 | 3 | P val. | MISC. | AH | MT | PH | P val. | COMP. | LONG. | FLAP | RADIAL | HORIZ. | ROOT | RAMP | P val. |
| 2002-2006 | APM | 140 (83.3) | 47 (59.5) | <.001 | 61 (87.1) | 107 (82.9) | 19 (39.6) | <.001 | 44 (73.3) | 7 (53.8) | 21 (60) | 115 (82.7) | .009 | 111 (73.5) | 10 (66.7) | 40 (95.2) | 20 (66.7) | 6 (66.7) | | | .001 |
| | MR | 1 (0.6) | 0 (0) | | 0 (0) | 1 (0.8) | 0 (0) | | 0 (0) | 0 (0) | 1 (2.9) | 0 (0) | | 0 (0) | 1 (6.7) | 0 (0) | 0 (0) | 0 (0) | | | |
| | Other | 27 (16.1) | 32 (40.5) | | 9 (12.9) | 21 (16.3) | 29 (60.4) | | 16 (26.7) | 6 (46.2) | 13 (37.1) | 24 (17.3) | | 40 (26.5) | 4 (26.7) | 2 (4.8) | 10 (33.3) | 3 (33.3) | | | |
| 2007-2011 | APM | 337 (96.3) | 164 (82.8) | <.001 | 260 (91.2) | 187 (97.4) | 54 (76.1) | <.001 | 175 (95.1) | 15 (50) | 35 (81.4) | 276 (94.8) | <.001 | 172 (88.7) | 207 (94.1) | 42 (100) | 65 (90.3) | 14 (100) | 1 (16.7) | | <.001 |
| | MR | 2 (0.6) | 14 (7.1) | | 14 (4.9) | 2 (1) | 0 (0) | | 0 (0) | 11 (36.7) | 5 (11.6) | 0 (0) | | 5 (2.6) | 4 (1.8) | 0 (0) | 4 (5.6) | 0 (0) | 3 (50) | | |
| | Other | 11 (3.1) | 20 (10.1) | | 11 (3.9) | 3 (1.6) | 17 (23.9) | | 9 (4.9) | 4 (13.3) | 3 (7) | 15 (5.2) | | 17 (8.7) | 9 (4.1) | 0 (0) | 3 (4.2) | 0 (0) | 2 (33.3) | | |
| 2012-2016 | APM | 180 (65.7) | 245 (79.3) | <.001 | 169 (61.9) | 179 (82.5) | 77 (82.8) | <.001 | 128 (86.5) | 20 (66.7) | 57 (80.3) | 220 (65.9) | <.001 | 169 (90.4) | 121 (51.9) | 46 (100) | 69 (82.1) | 19 (95) | 1 (8.3) | 0 (0) | <.001 |
| | MR | 83 (30.3) | 25 (8) | | 87 (31.9) | 20 (9.2) | 1 (1.1) | | 16 (10.8) | 7 (23.3) | 4 (5.7) | 81 (24.2) | | 7 (3.7) | 91 (39.1) | 0 (0) | 2 (2.4) | 0 (0) | 7 (58.3) | 1 (100) | |
| | Other | 11 (4) | 39 (12.7) | | 17 (6.2) | 18 (8.3) | 15 (16.1) | | 4 (2.7) | 3 (10) | 10 (14) | 33 (9.9) | | 11 (5.9) | 21 (9) | 0 (0) | 13 (15.5) | 1 (5) | 4 (33.4) | 0 (0) | |
| 2017-2021 | APM | 57 (17.5) | 34 (18.1) | <.001 | 23 (6.2) | 55 (43.7) | 13 (86.6) | <.001 | 13 (19.1) | 9 (56.3) | 15 (55.6) | 54 (13.4) | <.001 | 58 (56.9) | 4 (1.4) | 15 (88.2) | 10 (37) | 2 (22.2) | 1 (1.9) | 0 (0) | <.001 |
| | MR | 267 (81.9) | 151 (80.3) | | 346 (93) | 71 (56.3) | 1 (6.7) | | 55 (80.9) | 7 (43.8) | 12 (44.4) | 344 (85.4) | | 43 (42.1) | 287 (98) | 2 (11.8) | 17 (63) | 7 (87.8) | 52 (98.1) | 10 (76.9) | |
| | Other | 2 (0.6) | 3 (1.6) | | 4 (1.1) | 0 (0) | 1 (6.7) | | 0 (0) | 0 (0) | 0 (0) | 5 (1.2) | | 1 (1) | 2 (0.6) | 0 (0) | 0 (0) | 0 (0) | 0 (0) | 3 (23.1) | |

# RESULTS

- 1892 patients met the criteria for inclusion

- 49.1% of the meniscal tears were found to be repairable; an increase was found through the years: from 1.6% in 2002-2006 to 82.3% ($p<0.001$) in 2017-2021.

- Both sexes experimented >80% increase in the presence of repairable tears, which surpassed the 95% in patients <30 years old. Patients >45 y.o. experimented a 50% increase ($p<0.001$).

- Injuries to the left knee were found to be more repairable (85.2% vs 80.3%; $p<0.001$). More repairable tears were found in the medial meniscus (83.1 vs 80.9%; $p<0.001$) and the posterior horn was the most common location for those tears (86.4%; p<001).

- Regarding the surgical procedures performed, meniscectomies decreased from a peak 91.4% in 2007-2011 to a 17.7% in 2017-2021 ($p<0.001$) while meniscal repair increased from 0.4% in 2002-2006 to 81.3% in 2017-2021 ($p<0.001$), matching the percentage of repairable tears.

# CONCLUSIONS

In the present study, the proportion of repairable tears and meniscal repairs increased progressively over the last 20 years and matched in over an 80% of the cases in the last period analyzed. This findings were especially due to the increase of repairs on longitudinal tears and the consideration of other types of tears as repairable, such as complex, root or radial tears

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