MRI Evaluation of Peroneal Pathology Compared with Intraoperative Observation

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Purpose

Peroneal pathologies cause pain and functional impairment and are frequent clinical entities treated by foot and ankle surgeons. For diagnostic confirmation and to guide treatment, magnetic resonance imaging (MRI) is often employed. This study compares MRI results with intraoperative evaluation to determine the accuracy of MRI findings with regard to diagnosis of peroneal pathology.

Level of Evidence

Level III

Methods

- Inclusion criteria
  - Undergoing peroneal tendon surgery primarily or as adjunctive exploration
  - Pre-operative MRI
- Pre-operative MRI findings were compared with peroneal pathology directly observed during surgery
  - MRIs were interpreted by board-certified radiologists who were fellowship-trained in musculoskeletal radiology
  - Intraoperative evaluation was performed by a single board-certified foot and ankle surgeon (JJS)
- Sensitivity, specificity, accuracy, positive predictive value (PPV), and negative predictive value (NPV) for each pathology were calculated with intraoperative findings as the reference standard

Literature Review

MRI findings are generally well-concordant with intraoperative findings, as demonstrated by Kuwada in 2008 with surgery confirming MRI-elucidated tears of foot and ankle ligaments and tendons 83% of the time.[1] Despite relative accuracy with this region's structures, MRI-reported peroneal pathology has historically correlated more poorly to surgical findings, with recent accuracy rates ranging between 57% and 78% for peroneal tears.[1,2] The detection of peroneal tendon tears on MRI can be influenced by ankle position while the image is obtained, *viz.* the "magic angle phenomenon," and it is conceivable that ankle position may also influence the detection of other pathologies, such as that of a low-lying muscle belly.[3-5]

Results

114 consecutive cases involving peroneal peroneal tendon surgery were reviewed and 79 patients with 80 feet met the inclusion criteria. 57 (72%) of the included patients were female and 22 (28%) were male. Mean patient age was 44 ± 16.2 years (45 ± 15.8 years for females, 42 ± 17.9 years for males). 80 feet (38 right and 42 left) were included. The average duration of symptoms prior to surgery was 7 months. Correlation of MRI and surgical findings varied between pathologies observed. Sensitivity, specificity, PPV, NPV, and accuracy for each pathology are presented in Table 1.

Peroneus longus (PL) tendinosis was the most common MRI finding (33 cases, 41%), followed by longitudinal split tear of the peroneus brevis (PB) tendon (25 cases, 31%) and PB linear tear (13 cases, 15%). With regard to surgical findings, low-lying PB muscle belly was most common (56 cases, 70%), followed by PB tendon flattening (49 cases, 61%), PB longitudinal split tear (35 cases, 44%), and PB tendinosis (23 cases, 29%).

MRI sensitivities highest for PL partial linear tear (66.7%) and PB longitudinal split tear (62.9%). Lowest MRI sensitivities noted for PB low-lying muscle belly (7.1%), PB flattening (10.2%), PL split tear (16.7%), and accessory muscle presence (25%).

Pathology	Sensitivity (%)	Specificity (%)	PPV (%)	NPV (%)	Accuracy (%)
PB Normal	50	73.5	3.4	98	63.8
PL Normal	44.1	73.9	55.6	64.1	61.3
Tenosynovitis	37.5	84.7	21.4	92.4	80
PB Hypertrophy	0	98.6	0	87.3	86.3
PL Hypertrophy	0	93.9	0	81.6	77.5
PB Tendinosis	4.3	82.5	9.1	68.1	60
PL Tendinosis	31.6	55.7	18.2	72.3	50
PB Partial Linear Tear	0	83.3	0	97	81.3
PL Partial Linear Tear	66.7	89.6	20	89.6	88.8
PB Longitudinal Split	62.9	93.3	88	76.4	80
PL Longitudinal Split	16.7	91.9	14.3	93.2	86.3
PB Complete Rupture	100	100	100	100	100
PL Complete Rupture	0	100	0	100	97.5
PB Flattening	10.2	90.3	62.5	38.9	45
PL Flattening	0	100	0	92.5	92.5
PB Low Lying Muscle Belly	7.1	100	100	31.6	35
Accessory Muscle	25	100	100	96.2	96.3
Os Peroneum	33.3	97.4	33.3	98.7	96.3
PB Ganglion Cyst	0	98.8	0	100	98.8
PL Ganglion Cyst	0	98.8	0	100	98.8

Table 1. Statistical analysis.

Discussion

- MRI least accurate for determining the presence of a low-lying PB muscle
  - Defined as extension of the muscle 1.5 cm distal to the fibular groove[6]
  - Causes pain and promotes other pathology due to crowding within the retromalleolar groove
  - Intraoperative ability to evaluate distal extent of the PB muscle belly in multiple positions may explain the disparity in accuracy
- MRI accuracy also poor for PB flattening, PB/PL tendinosis, and normal PB/PL tendons
  - The low NPV of normal PL tendon on MRI may be partially attributable to the magic angle phenomenon
    - May also account for low PPV of PL tendinosis
- Accuracy of MRI highest (> 90%) for ganglion cysts, os peroneum, accessory muscle presence, tendon ruptures, and PL flattening
- Limitations
  - Retrospective
  - Intraoperative evaluation by one surgeon
    - Did not allow assessment of intra-/interobserver reliability
    - Adding more research centers could improve
  - Interobserver/intraobserver reliability among radiologists not assessed
    - An integrated comparison study of radiologists' interpretations to their selves and peers could improve

Conclusion

MRI is useful for pre-operative evaluation of the peroneal tendons, but there are imaging limitations that vary with specific pathologies. The importance of clinical examination in treatment of these conditions without over-reliance upon imaging is paramount.

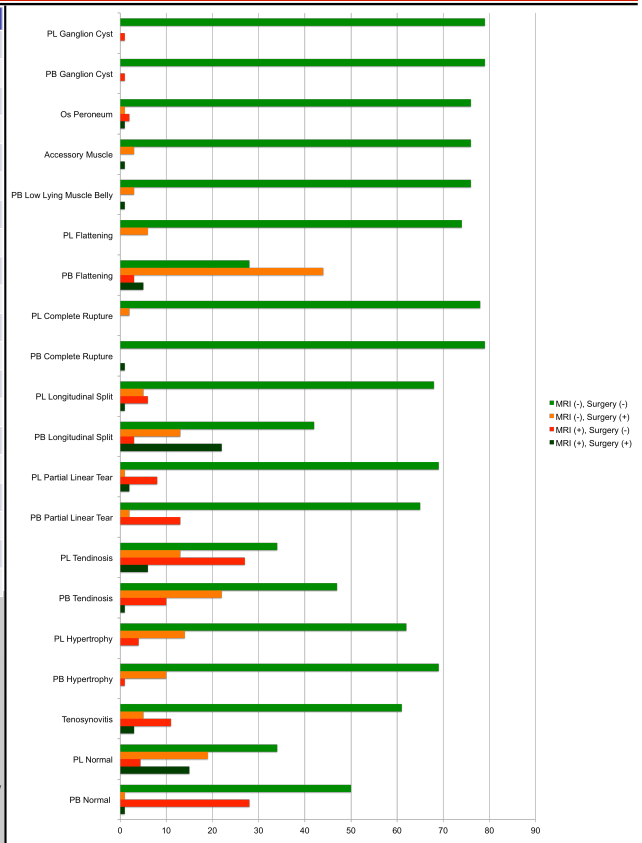

Figure 1. Comparison: MRI versus surgical observations.

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