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COMPARATIVE ANALYSIS OF DIAGNOSTIC METHODS IN MENISCAL LESIONS

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Abstract

The aim of this study is to determine the accuracy of clinical and MRI diagnosis in comparison with arthroscopy for detection of meniscal lesions.

Also, to answer if MRI diagnosis impacts on the decision of the surgeon for the choice of treatment (operative or conservative).

Material and methods: We examined 70 patients with knee injuries. Clinical diagnosis was established using the case-history of the patient and positive clinical tests for meniscal injuries (McMurray and Aplay). All patients underwent MRI on a 1.5 T magnet for MRI diagnosis. This was followed by arthroscopy for final diagnosis. Clinical and MRI diagnoses were correlated with the arthroscopic diagnosis which was used as a gold standard.

Results: Of 70 patients with knee injuries, 55 had a clinical diagnosis of meniscal lesions out of whom 44 patients had a medial meniscal lesion and 11 had a lateral meniscal lesion. Arthroscopy confirmed the clinical diagnosis in 32 patients (72.72%) (44 vs 32) in medial meniscal lesion, and 8 patients (72.7%) (11 vs 8) with a lateral meniscal lesion. In MRI diagnosis of 56 patients with medial meniscal lesion arthroscopy confirmed the diagnosis in 34 patients (60.7%) (56 vs 34) and pf 10 patients with lateral meniscal lesion arthroscopy confirmed the diagnosis in 6 patients (60%) (10 vs 6). The sensitivity, specificity, PPV and NPV of clinical diagnosis versus MRI for medial meniscus were (79.9% vs 79.5%); (58.1% vs 38.1%); (69.8% vs 69.6%); (69.2% vs 69.2%). The sensitivity, specificity, PPV and NPV of clinical diagnosis versus MRI for lateral meniscus were (50% vs 40%); (92.7% vs 92.7%); (63.6% vs 60%); (87.9% vs 85.5%).

Conclusions: Carefully performed clinical examination can give an equal or better diagnosis of meniscal lesions in comparison with MRI diagnosis. Any experienced orthopaedic surgeon can trust his clinical diagnosis as an indication of arthroscopy. When the clinical diagnosis is established, with no doubts due to positivity of the clinical tests, the MRI is not essential. In suspected cases where there is a dilemma, MRI is very helpful in making a decision for arthroscopy.

The diagnostic accuracy of clinical and MRI diagnosis of meniscal lesions is high. Their reliability in diagnosing meniscal lesions is evident.

Key words: Meniscal lesion, clinical diagnosis, MRI, arthroscopy.

Introduction

Diagnosis of meniscal lesions is established using clinical examinations and MR imaging of the injured knee. Both methods are used for obtaining data, and so the decision for performing arthroscopy or not is based on them.

The history of the patient is used for obtaining data about the mechanism of the injury, localization of the pain, swelling, limitations, etc. [1]. Several clinical tests are used for diferentiation if there are meniscal, ligamentous or cartilage injuries [2, 3]. Meniscal lesions are the most common. They can often be combined with other ligamentous or cartilage injuries. Sometimes it is difficult to give a precise clinical diagnosis. Performing MRI as an additional

diagnostic method is useful to enrich the data, so that the decision about the arthroscopy is easily made [4]. Positive clinical and MRI diagnosis for knee injuries gives us an indication for arthroscopy. Arthroscopy is a gold standard for diagnosis and at the same time it is an operative method used for minimal invasive treatment of meniscal lesions [4, 5].

Aim

The aim of this study is to determine the accuracy of clinical and MRI diagnosis in comparison with arthroscopy for the detection of meniscal lesions.

Also, to answer whether MRI diagnosis impacts on the desision of the surgeon for the choice of treatment (operative or conservative).

Material and methods

We examined 70 patients with knee injuries. Only those with meniscal lesions were analysed in this study. Patients with ligamentous or cartilage injuries were not analysed.

Inclusion criteria were as follows: all patients must have a clinical diagnosis of meniscal lesion, MRI of the injured knee and arthroscopy.

Patients with degenerative osteoarthritis, intra-articular fractures, loose bodies, disecant osteochondritis and inflammations were excluded from the study.

Clinical diagnosis was established using the patient's case-history and positive clinical tests for meniscal injuries (McMurray and Aplay). All patients underwent MRI with a 1.5 T magnet for MRI diagnosis. This was followed by arthroscopy for final diagnosis.

Clinical, MRI and arthroscopic diagnoses were statistically analysed. Clinical and MRI diagnoses were correlated with arthroscopic diagnosis, which was used as a gold standard. To determine the credibility of the clinical examinations and MRI, sensitivity, specificity, positive predictive value (PPV), negative predictive value (NPV) and accuracy were assessed.

Results

Of 70 patients with knee injuries, 55 had a clinical diagnosis of meniscal lesions and of them 44 patients had a medial meniscal lesion and 11 a lateral meniscal lesion. Arthroscopy confirmed the accuracy of clinical diagnosis in 32 patients (72.72%) (44 vs 32) in medial meniscal lesion, and 8 patients (72.7%) (11 vs 8) in lateral meniscal lesion. In MRI diagnosis of 56 patients with medial meniscal lesion, arthroscopy confirmed the accuracy in 34 patients (60.7%) (56 vs 34) and of 10 patients with lateral meniscal lesion arthroscopy confirmed the accuracy in 6 patients (60%) (10 vs 6).

The sensitivity of clinical diagnosis versus MRI for medial meniscus (79.9% vs 79.5%) was identical. The specificity of clinical diagnosis was better in comparison with MRI (58.1% vs 38.1%). Positive predictive values (69.8% vs 69.6%) and negative predictive values (69.2% vs 69.2%) for medial menuscus were the same. (Table 1)

Table 1

Statistical methods for medial meniscal lesions

Medial meniscus	McMurray	Aplay	Clinical Dg	MRI
Sensitivity (95% CI)	82% (66.6–90,8)	63.15% (49.9–78.8)	79.9% (63.7–88.9)	79.5% (65.9–85.8)
Specificity (95% CI)	58.1% (40.8–3.6%)	62.5% (46.9–78.9)	58.1% (40.8–73.6)	38.1% (25.6–55.4)
PPV (95% CI)	70.5% (55.8–81.8)	66.7% (53.1–82)	69.8% (54.9–81.4)	69.6% (56.7–81.4)
NPV (95% CI)	72% (52.4–5.7%)	60.6% (43.7–75.3)	69.2% (50–83.5)	69.2% (42.4–87.3)
LR+	1.948	1.854	1.883	1.254
LR-	0.317	0.53	0.363	0.374
Diagnostic accuracy	71.01%	63.8%	69.6%	68.5%
Area Under Roc curve (95% CI)	0.712 0.583–0.841	0.65 0.519–0.781	0.695 (0.565–0.825)	0.661 0.503–0.818

The sensitivity of clinical diagnosis versus MRI for lateral meniscus (50% vs 40%) was better. The specificity of clinical diagnosis in comparison with MRI (92.7% vs 92.7%) was identical. Positive predictive values (63.6% vs 60%) and negative predictive values (87.9% vs 85.5%) for lateral menuscus were the same.

The diagnostic accuracy of clinical diagnosis was higher in comparison with MRI for medial meniscal lesion (69.6% vs 68.5%) and for lateral meniscal lesion (84% vs 82.6%). (Table 2)

Table 2

Statistical methods for lateral meniscal lesions

Lateral meniscus	McMurray	Aplay	Clinical Dg	MRI
Sensitivity (95% CI)	53.3% (30.1–75.2)	50% (26.8–73.2)	50% (26.8–73.2)	40% (19.8–64.3)
Specificity (95% CI)	94.4% (84.9–98.1)	96.4% (87.7–99)	92.7% (82.7–97.1)	92.7% (82.7–97.1)
PPV (95% CI)	72.7% (43.4–90.3)	77.8% (45.3–93.7)	63.6% (35.4–84.8)	60% (33.3–83.2)
NPV (95% CI)	87.9% (77.1–94)	88.3% (77.8–94.2)	87.9% (77.1–94)	85.5 (73.9–91.9)
LR+	9.6	13.75	6.875	5.5
LR-	0,494	0,519	0,539	0,647
Diagnostic accuracy	85.5%	86.9%	84%	82.6%
Area Under Roc curve (95% CI)	0.831 (0.664–0.997)	0.785 (0.58–0.936)	0.785 (0.58–0.936)	0.675 0.476–0.874

Legend: PPV – positive predictive values; NPV – negative predictive values; LR+ – likelihood ratio positive; LR- – likelihood ratio negative; AUC – area under the curve

Discussion

An analysis of the results in this study corresponds with the results from similar studies exploring this field. The conclusions were identical. Authors point out that clinical examination is more reliable in diagnosing meniscal lesions, although previously it was assumed that MRI was essential in establishing an accurate diagnosis.

Rayan F, et al. analysed 87 patients with meniscal lesions. They conclude that clinical examination has better sensitivity (86% vs 76%), specificity (73% vs 52%) and diagnostic accuracy (79% vs 63%) in comparison to MRI for diagnosing medial meniscal lesions. In lateral meniscal lesions sensitivity (56% vs 61%), specificity (95% vs 92%) and diagnostic accuracy (85% vs 85%) were almost the same [6].

Rose NE, et al. refer to similar results in accuracy between clinical examination and MRI. Diagnostic accuracy for medial meniscal lesions was 82% vs 75%, and for lateral meniscal lesions 76% vs 69% [7].

Kocabey Y, et al. and Bohnsack M, et al. state that clinical examination is as accurate as MRI in the skilled orthopaedic surgeon's hands and MRI should be reserved for more complicated and confusing cases [8, 9].

BR Mohan, et al. report a accuracy of clinical diagnosis of 88% for medial meniscal lesions and 92% accuracy for lateral meniscal lesions [10].

Dutka J, et al. report 113 patients who had better sensitivity with MRI in comparison to clinical examination for medial meniscal tears (88% vs 65%) and for lateral meniscal tears (44% vs 38%) [11].

Jolene Hardy C, et al. refer to the sensitivity, specificity and accuracy of MRI diagnosis (90%, 59%, 76%) in comparison with clinical diagnosis (93%, 55%, 73%) [12].

Miller GK states that accuracy of clinical diagnosis of meniscal lesions was 80.7% in comparison with an accuracy of MRI diagnosis of 73.7% [13].

Some authors analyse only the accuracy of MRI in comparison with arthroscopy. Their results were as follows: Aydingöz U, et al. report a 90% sensitivity of MRI in detection of bucket

handle lesions of meniscus. Cellár R, et al. refer to the high sensitivity of MRI (92%) for medial meniscal lesions and a 70% sensitivity of MRI for lateral meniscal lesions [14, 15].

Diagnosis of intra-articular lesions of the knee is complex process which includes clinical examination and MRI of the injured knee. But sometimes MRI is used more frequently than necessary because it is a very precise method for the visualization of soft tissues. Nevertheless, MRI does not decrease the value of orthopaedic clinical examination as an indication for arthroscopy.

Conclusions

We conclude that carefully performed clinical examination can give an equal or better diagnosis of meniscal lesions in comparison with MRI diagnosis. Any experienced orthopaedic surgeon can trust his clinical diagnosis as an indication for arthroscopy. When the clinical diagnosis is established, with no doubts due to the positivity of the clinical tests, MRI is not essential. In suspected cases, where there is a dilemma, MRI is very helpful in making a decision for arthroscopy.

The diagnostic accuracy of clinical and MRI diagnosis of meniscal lesions is high. Their reliability in the diagnosis of meniscal lesions is evident.

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Резиме

КОМПАРАТИВНА АНАЛИЗА НА ДИЈАГНОСТИЧКИТЕ МЕТОДИ КАЈ МЕНИСКАЛНИТЕ ЛЕЗИИ

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Целта на трудот е да се утврди точноста на клиничката дијагноза и МРИ дијагнозата во компарација со артроскопската дијагноза за детекција на менискалните лезии.

Исто така да се одговори на прашањето дали МРИ дијагнозата влијае на одлуката на ортопедот во изборот на лекувањето (оперативно или конзервативно).

Материјал и методи: Обработени беа 70 пациенти со повреди на коленото. За поставување на клиничка дијагноза беа употребени анамнеза и позитивни клинички тестови (McMurray и Aplay) за повреда на менискус.

МРИ со јачина од 1,5 тесла се користеше за поставување на МРИ дијагноза.

Артроскопија се правеше за да се добие точна дијагноза за повредата на менискусот. Статистички беа анализирани трите дијагностички методи, притоа клиничката и МРИ дијагнозата беа корелирани со артроскопската дијагноза која ја користевме како златен стандард за анализа на резултатите.

Резултати: Од 70 пациенти со повреди на колено, 55 беа со клиничка дијагноза за менискални лезии, 44 од нив со повреда на медијалниот менискус и 11 со повреда на латералниот менискус.

Артроскопијата потврди точност на клиничката дијагноза кај 32 пациенти или 72,72% (44 vs 32) за повреда на медијален менискус и 8 пациенти за повреда на латерален менискус или 72,7% (11 vs 8).

Кај МРИ дијагнозата од 56 пациенти со повреда на медијалниот менискус артроскопијата потврди 34 пациенти (60,7%) (56 vs 34), а кај латералниот менискус од 10 пациенти, артроскопијата потврди 6 (60%) (10 vs 6). Сензитивноста, специфичноста, ППВ и НПВ на клиничката дијагноза во однос на МРИ дијагнозата за медијален менискус беа (79,9% vs 79,5%); (58,1% vs 38,1%); (69,8% vs 69,6%); (69,2% vs 69,2%). Сензитивноста, специфичноста, ППВ и НПВ на клиничката дијагноза во однос на МРИ дијагнозата за латерален менискус беа (50% vs 40%); (92,7% vs 92,7%); (63,6% vs 60%); (87,9% vs 85,5%).

Заклучок: Дојдовме до заклучок дека внимателно направениот клинички преглед дава иста или поточна клиничка дијагноза во компарација со дијагнозата поставена од МРИ за менискална лезија.

Тоа укажува дека секој искусен ортопедски хирург може да се потпре на клиничката дијагноза како индикација за артроскопија. Кога ќе се постави клиничка дијагноза, без сомнеж за позитивноста на клиничките тестови, тогаш правењето на МРИ не е неопходно. Во случаи каде што постои дилема, МРИ е од голема помош во одлуката на ортопедот за артроскопија.

Дијагностичката точност на клиничката и МРИ дијагноза е висока. Нивното влијание во поставување на дијагноза за менискална лезија е евидентно.

Клучни зборови: менискални лезии, клиничка дијагноза, МРИ, артроскопија.