Accuracy of McMurray's Test, Modified Version and Joint Line Tenderness in Diagnosing Chronic Meniscus Tear in Knee Joint

BY

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Dissertation Submitted in Partial Fulfillment of the Requirement for the Degree of Master of Medicine (ORTHOPAEDIC)

UNIVERSITI SAINS MALAYSIA

2017

Accuracy of McMurray's Test, Modified Version and Joint Line Tenderness in Diagnosing Chronic Meniscus Tear in Knee Joint

FROM JANUARY 2016 TILL JUNE 2017

STUDY VENUE: HOSPITAL UNIVERSITI SAINS MALAYSIA

ACKNOWLEDGEMENTS

The author would like to express deepest gratitude and thanks to the following individuals for their advice, guidance, comments and support during the preparation of this dissertation.

- Associated Professor Tengku Muzzafar, supervisor of this study, and lecturer of Orthopaedic Department, HUSM for his guidance and patience during the course of this study and completion of this paper.
- Dr Najib Majdi Yaacob, Senior lecturer Unit of Biostatistics and Research Methodology, School of Medical Sciences University Sains Malaysia for his help in medical statistic and data analysis
- Colleagues and all staff in Orthopaedic Department, HUSM

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ABSTRAK

Pengenalan

Ujian khas klinikal memainkan peranan penting dalam pemeriksaan fizikal untuk mendiagnosis kecederaan “meniscus” dalam sendi lutut. Di antara ujian-ujian khas itu, ujian “Original McMurray”, Versi Diubahsuai McMurray, dan “Jointline tenderness (JLT)” biasa digunakan dalam amalan klinikal mahupun di pusat “primary care”. Literatur yang terhad mengambil kira jangka masa kecederaan “meniscus” untuk ketepatan diagnostik ujian klinikal sedemikian. Oleh itu, ketepatan diagnostik ujian-ujian khas itu adalah tidak jelas dan banyak dipersoalkan dalam literature.

Kaedah/Cara

Ini adalah kajian keratan rentas dan 50 pesakit telah didaftarkan dari Januari 2016 hingga Jun 2017. Kriteria inklusi adalah pesakit yang mengalami jangka masa kecederaan “meniscus” dalam lutut lebih daripada 6 bulan, berusia 16 tahun atau lebih dan menjalani pembedahan “arthroscopic” lutut. Semua pesakit menjalani pemeriksaan fizikal terlebih dahulu sebelum menjalani “arthroscopy” lutut oleh pakar bedah ortopedik yang sama. 5 parameter statistik dikira: ketepatan, kepekaan, spesifikasi, nilai ramalan positif (PPV) dan nilai ramalan negatif (NPV) untuk ketepatan diagnostik.

Keputusan

Umur minima adalah 25.7 tahun dari 16 hingga 44 tahun (SD 6.8 tahun). Ujian Mc-Murray versi yang diubahsuai menunjukkan kepekaan tertinggi untuk kedua-dua medial meniscus (36.36%) dan lateral meniscus (35.29%). Ia juga mempunyai NPV tertinggi (64.10% medial dan 73.17% -lateral) dan PPV tertinggi (72.73% medial dan 66.67% -lateral). Ia juga mempunyai ketepatan tertinggi pada 66% (medial) dan 72% (lateral). Ujian asal Mc-Murray

menunjukkan sensitiviti yang paling rendah untuk lesi sisi (18.75%) namun mempunyai kekhususan tertinggi untuk kedua-dua luka (92.59% -medial dan 91.18% -lateral). JLT menunjukkan kekhususan terendah pada 89.29% (medial) dan 87.88% (lateral). Ia juga menunjukkan ketepatan yang paling rendah untuk medial meniscus (60%) dan ketepatan yang sama dengan ujian Original Mc-Murray pada 68% untuk lesi lateral.

Kesimpulan

Keputusan menunjukkan bahawa ujian asal McMurray, versi Modified dan JLT untuk mendiagnosis kecederaan meniskus kronik mempunyai sensitiviti rendah dan "specificity" yang tinggi. Ia juga menunjukan bahawa versi modified Mc-Murray mempunyai "Acuracy" tertinggi disbanding dengan ujian Mc-Murray asal dan JLT. Dalam amalan klinikal, ujian-ujian khas ini tidak harus digunakan secara individu, tetapi harus digunakan dalam kombinasi antara satu sama lain.

Key Words:

Meniscus tear, Mc-Murray test, Joint-line tenderness, modified Mc-Murray

ABSTRACT

Introduction: "Special clinical test" played an important role in physical examination and are thought to diagnose meniscus injury. Among those special tests, original McMurray's test, modified version of McMurray, and joint line tenderness (JLT) are commonly used in practice. There were only limited literatures that take into consideration of the injury time of the meniscus for the diagnostic accuracy of such clinical test. Therefore, in chronic meniscus injury the diagnostic accuracy of those special tests were unclear and questionable.

Material & Method: This is a cross sectional study and 50 patients enrolled from January 2016 till June 2017. The inclusion criteria were patients had duration injury of more than 6 month, at least 16 years old or older and underwent knee arthroscopic surgery. All patients underwent physical examination first then schedule for arthroscopy performed by the same surgeon. 5 statistical parameters were calculated based on the formula: accuracy (%), sensitivity (%), specificity (%), positive predictive value (PPV %) and Negative predictive value (NPV %).

Results: The mean age was 25.7 years ranging from 16 to 44 years old (SD 6.8 years). Modified version Mc-Murray test showed the highest sensitivity for both medial lesion (36.36%) and lateral lesion (35.29%). It also had highest NPV (64.10% -medial and 73.17%-lateral) and highest PPV (72.73%-medial and 66.67%-lateral). It also had highest accuracy at 66% (medial) and 72% (lateral). Original Mc-Murray test showed lowest sensitivity for lateral lesion (18.75%) however highest specificity for both lesion (92.59%-medial and 91.18%-lateral). JLT showed lowest specificity at 89.29% (medial) and 87.88% (lateral). It also showed lowest accuracy for medial lesion (60%) and same accuracy with Original Mc-Murray test at 68% for lateral lesion.

Conclusion: The results indicate that Original McMurray's test, Modified version and JLT have overall low sensitivity and high specificity in diagnosing chronic meniscal tear. It also highlights that Modified versions Mc-Murray test had highest accuracy than the original Mc-Murray test and JLT. However in clinical practice, those special tests should not standalone, but should use in combination for better accurate diagnosing chronic meniscus tear.

Key Words:

Meniscus tear, Mc-Murray test, jointline tenderness, modified Mc-Murray, knee, physical examination

1.1 INTRODUCTION

Meniscus is commonly injured among either professional, amateur athletes or even non-athletes and is one of the most common indications for knee surgery[1]. Meniscus injury is a frequently encounter for the clinical orthopaedics. The evaluation of such injuries is not always easy even the experience orthopaedic surgeon. Diagnosing meniscus injury were consists of history taking, physical examination and imaging studies[2]. However, histories of meniscus injury were often unspecific with ranging from complaints of knee pain, locking, catching, clicking and maybe seen in others ligamentous injury of the knee joint[3-5]. Moreover, in real clinical practice meniscus injury most often concomitant with others ligamentous injury making the evaluation of such injuries is not straight forward[4].

"Special clinical test" played an important role in physical examination and are thought to diagnose meniscus injury[5]. Among those special tests, original McMurray's test, modified version of McMurray, and joint line tenderness (JLT) are commonly used in practice even in primary health care center[1]. Those special tests that have been used for the detection of such injuries are not easy to perform and seem to be prone to errors. Besides, the diagnostic accuracy of the various special tests has been questioned and discussed controversially. Based on the previous published systemic reviews and meta-analysis, the accuracy of those special tests still remains poor to diagnosed meniscus injury and the result remain unclear until nowadays[4,5].

In real life clinical practice, meniscus injury concomitant with associated injuries such as anterior/posterior cruciate ligament injury or collateral ligament are not uncommon[4, 5]. Moreover, some patients who present late in chronic feature may make the diagnosis be overlooked. Most often chronic injury always presented with a subtle clinical pattern and makes the evaluation more difficult[3]. However, there were only limited literatures that take into consideration of the injury time of the meniscus for the diagnostic accuracy of such clinical test. Therefore, in chronic meniscus injury the diagnostic accuracy of those special tests were unclear and questionable.

The main objective of this study was to determine the diagnostic accuracy which includes sensitivity, specificity and the diagnostic accuracy of the original description of the Mc-Murray Test compare with modified version and joint line tenderness in chronic meniscus injury of knee joint. In this study also looked into symptoms of locking and knee pain association of knee arthroscopy finding of meniscus injury.

1.2 OBJECTIVE

a) Determine the diagnostic accuracy which includes sensitivity, specificity and the diagnostic accuracy of the original description of the Mc-Murray Test compare with modified version and joint line tenderness in chronic meniscus injury of knee joint.
b) To evaluate the symptoms knee pain and locking in chronic meniscus injury and their association with the arthroscopic finding.

DESERTATION PROPOSAL

TITLE: Accuracy of McMurray's Test, Modified Version and Joint Line Tenderness in Diagnosing Chronic Meniscus Tear in Knee Joint

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INTRODUCTION

Meniscus injuries are very common among athletes and are one of the most common indications for knee surgery[1]. The evaluation of such injuries is not always easy[2].The specific clinical tests that have been used for the detection of such injuries do not have high sensitivity and specificity values[1]. Despite the increasing use of noninvasive and invasive diagnostic procedures for meniscal lesions, careful physical examination remains essential to the evaluation of the injured knee.[12]

Special clinical tests play a main role in the physical examination during the clinical assessment of knee pain[4], and a number of these special tests are thought to diagnose torn menisci such as Apley's, McMurray's and joint line tenderness (JLT) are commonly used in practice[6].The diagnostic accuracy and reliability of these special clinical tests for the detection of meniscal tears has been study extensively within the literature, yet still remains unclear.[8-11] Previous systematic reviews have not limited the age range and chronicity of the injured of included participants. In addition, there exists some confusion over the definitions of the test procedures.[8-11] For example, McMurray's test its use and application now varies widely with the originally described.[5]

RATIONALE

1. Few systematic reviews on the diagnostic accuracy of special tests for meniscal tears was conducted, still with unclear results.[8-11,13]

2. Confusion over the definition of the original Mc-Murray test, and its use and application now varies widely.[13]

3. The validity of the McMurray's test varied widely, and no proper study on validity in chronic injury.[13]

OBJECTIVES

- Determine the diagnostic accuracy which includes sensitivity, specificity and the diagnostic accuracy of the original description of the Mc-Murray Test compare with modified version and joint line tenderness in chronic meniscus injury of knee joint.

- To evaluate the symptoms knee pain and locking in chronic meniscus injury and their association with the arthroscopic finding.

Definition

Original description of Mc-Murray Test:

"With the patient lying flat, the knee is first fully flexed; the foot is held by grasping the heel. The leg is rotated on the thigh with the knee still in full flexion. By altering the position of flexion, the whole of the posterior segment of the cartilages can be examined from the middle to their posterior attachment. Bring the leg from its position of acute flexion to a right angle while the foot is retained first in full internal rotation and then in full external rotation. When the click occurs (in association with a torn meniscus), the patient is able to state that the sensation is the same as he/she experienced when the knee gave way previously."[6]

MODIFIED VERSION OF MCMURRAY

Patient's knee is fully flexed with the patient in the supine position. The therapist's proximal grip is on the lateral aspect of the knee joint, with a finger placed on the medial joint line. The distal grip is above the ankle; the therapist laterally rotates the leg, applied a valgus force to the outer side of the knee and, maintaining the external rotation, and slowly extends the knee. The sound of a click, or the feel of one on the medial joint line, indicates a posterior medial meniscus lesion. To pick up a tear in the posterior lateral meniscus, the leg is internally rotated and a varus force is applied to the inside of the knee as the leg is extended.[20]

JOINT LINE TENDERNESS

The examiner grasps around the knee with one hand while pressing on the joint line with his/her thumb. The patient will feel pain along the joint line in a positive test. The patient lies supine on the bed while bending the hip and knee at 90°. [16]

Definition of Statistical Parameters

Term	Definition	Formula
Accu**racy**	Ability of the test to correctly detect the presence of absence of lesion	$\frac{\text{True POS+ True NEG}}{\text{Total}}$
Sensitivity	Ability of the test to correctly detect the presence of lesion	$\frac{\text{True POS}}{\text{True POS + False NEG}}$
Specificity	Ability of the test to correctly detect the absence of lesion	$\frac{\text{True NEG}}{\text{False POS + True NEG}}$
Positive Predictive Value	Frequency of the positive initial diagnosis confirmed postoperatively	$\frac{\text{True POS}}{\text{True POS + False POS}}$
Negative Predictive Value	Frequency of the negative initial diagnosis confirmed postoperatively	$\frac{\text{True NEG}}{\text{True NEG + False NEG}}$

LITERATURE REVIEW

1. BB Meserve et al (2008), meta-analysis of eleven articles. Joint line tenderness, McMurray's test– were compared in the meta-analysis. The methodological quality of the studies was found to have a significant effect on both the test sensitivities and specificities. Summary receiver operating characteristic (ROC) curves, sensitivity values, mean likelihood ratios and diagnostic odd ratios (DOR) uniformly show joint line tenderness (DOR=10.98) to be the best 'common' test, followed by McMurray's (DOR=3.99).Joint line tenderness (n=1354), McMurray's (n=1232). Methodological quality varied from poor to fair among studies, affecting test performance. Future studies should, where possible, utilize larger samples of individuals without meniscus lesions to better estimate test specificity and thus more accurately identify optimal clinical tests.

2. Wayne Hing et al (2009) a systematic literature review, eleven studies from March 1980 to May 2008.Mc-Murray's test sensitivity figures ranged from 27% to 70%, specificity figures from 29–96%.Medial meniscus pathology is more sensitive than testing for lateral; however, tests for lateral meniscus pathology are more specific than tests for medial pathology. Differences in study populations are likely to have contributed to the wide variability of results across studies. Those that exclude different pathologies may have biased results. Kurosaka et al stated that diagnostic accuracy is lessened in patients with multiple pathologies, whereas Akseki et al found that there was no reduction in diagnostic accuracy with an associated tear of the ACL. The inclusion of patients with different pathologies would make the results of studies more generalizable to the clinical setting. The varying definitions of a positive McMurray's test, which include both pain and a click, should have higher diagnostic value as compared to studies that just use one sign or the other.

3. Benjamin et al (2015), systematic review and meta-analysis which nine studies were included (n=1234). The methodological quality of the included studies was generally poor. McMurray's had a sensitivity of 61% (95% CI 45% to 74%) and a specificity of 84% (95% CI 69% to 92%). Joint line tenderness had a sensitivity of 83% (95% CI 73% to 90%) and a specificity of 83% (95%

CI 61% to 94%). The accuracy of the special tests to diagnose meniscus tears remains poor. However, these results should be used with caution, due to the poor quality of included studies and high levels of heterogeneity. This review cannot recommend the use of special tests for diagnosing meniscus tears. It is unclear, if further research would considerably alter this conclusion.

METHODOLOGY

- STUDY DESIGN:

  Cross sectional study
- PERIOD: 1 and half years
- LOCATION: HUSM
- STUDY PARTICIPANTS:

  All patients presented to HUSM sport clinic that undergo Knee Arthroscopy Surgery.
- INCLUSION:
  - Injury time more than 6 month.
  - Patient more than 16years old or more.
- EXCLUSION :
  - Injury time less than 6 month.
  - Previous knee replacement surgery.
  - Osteoarthritis.
  - Rheumatoid arthritis.
- SAMPLE SIZE[21]:

Sensitivity/Specificity – Estimation	
Expected Sensitivity	61.00%
Expected Specificity	84.00%
Prevalence of disease (p)	32.00%
Acceptable precision (W)	20.00%
Significance level (α)	0.050
Drop-out	5%
Sample size for Sensitivity	72
Sample size for Specificity	19
Final Sample size	72
Corrected Sample size	76

Corrected sample size: 76

(Buderer, N.M.F. (1996) Statistical methodology: Incorporating the prevalence of disease into the sample size calculation for sensitivity and specificity. Excel file by Dr Wan Nor Arifin (HUSM))

EVALUATION:

All patients underwent physical examination first then schedule for arthroscopy performed by the same surgeon. Positive of the Mc-Murray's test include "pain, click sound, thud sensation". Positive JLT include "pain along the joint line" The meniscus and other pathology was recorded during arthroscopy. These findings were then compared with Arthroscopy has been used as a gold standard measure for detection of meniscus injuries in knees.

Arthroscopy has demonstrated accuracy between 93%-96%.[14] Arthroscopy performed by an Orthopaedic Sport Surgeon in HUSM. The location of meniscus injuries, type of meniscus tears and evidence of cartilage injuries were recorded based on Newman's classification with the preoperative clinical findings.[18]

SUBJECT ETHICAL CONSIDERATION:

Physical examination performed can ocassionally cause pain at the knee joint. Otherwise it will not worsen the disease condition. These are non-interventional study thus similar type of physical examination still will be carry out if not enrolled of this study as those are part of physical examination accessment for meniscus injury. Subject will have no risk nor benefit from this study.

CONFIDENTIALITY:

All subject medical information will be kept confidential by the study doctor and staff and will not be made publicly available unless disclosure is required by law. Data obtained from this study that does not identify subject individually and will be published for knowledge purposes. Original medical records may be reviewed by the researcher, the Ethical Review Board for this study, and regulatory authorities for the purpose of verifying clinical trial procedures and/or data.

CONFLICT OF INTEREST AND FUNDING

There are no conflict of interest in this study. Subjects are not pay for enrolled in this study. There are no grant funding for this study either.

DATA ANALYSIS:

- Data entry
    - Data will be entered and analysed by using SPSS version 22

Data analysis method:

- Chi-square Test used to determine association presenting complaints of subject's knee pain and locking with arthroscopy finding.
- 5 statistical parameters were calculated: accuracy, sensitivity, specificity, positive predictive value (PPV), Negative predictive value (NPV) for diagnostic accuracy.

Descriptive analysis

Expected result (dummy table):

- Table 1 : Distribution of the types of the meniscal lesion

Types of the meniscal lesion	No. of knees
Medial meniscus injury with torn ACL	
Lateral meniscus injury with torn ACL	
Medial and lateral meniscus injury with torn ACL	
Isolated medial meniscus injury	
Isolated lateral meniscus injury	
Medial and lateral meniscus injury without torn ACL	
Torn ACL without meniscus injury	
Intact knees	
Total	

- Table 2.1 : The number of the knees manifested a positive or negative Mc-Murray Test

Truth visualization at Arthroscopy			
Medial Side	Meniscus tear present	Meniscus tear absent	
Mc-Murray test Positive	a true positives	b false positives	a+b
Negative	c false negatives	d true negatives	c+d
	a+c	b+d	a+b+c+d

- Table 2.2 : The number of the knees manifested a positive or negative Mc-Murray Test

Truth visualization at Arthroscopy			
Lateral Side	Meniscus tear present	Meniscus tear absent	Total
Mc-Murray test Positive	a true positives	b false positives	a+b
Negative	c false negatives	d true negatives	c+d
Total	a+c	b+d	a+b+c+d

Table 3.1: Comparison of False-Negative and True-Positive McMurray Test of Medial Meniscus Tears by Tear Location

Location of Meniscus tear Detected by Arthroscopy	No. (%) of Diagnoses		Total Number of Tears
	False-Negative	True Positive	
Anterior Horn			
Body			
Posterior Horn			
Unspecified			
Total			

Table 3.2: Comparison of False-Negative and True-Positive McMurray Test of Lateral Meniscus Tears by Tear Location

Location of Meniscus tear Detected by Arthroscopy	No. (%) of Diagnoses		Total Number of Tears
	False-Negative	True Positive	
Anterior Horn			
Body			
Posterior Horn			
Unspecified			
Total			

Table 4: Comparison of False-Negative and True-Positive McMurray Test of Medial/Lateral Meniscal Tears by Type of Meniscal Tear

Type of Meniscus tear Detected by Arthroscopy	No. (%) of Diagnoses		Total Number of Tears
	False-Negative	True Positive	
Bucket-handle			
Complex			
Horizontal			
Radial			
Root			
Unspecified			
Total			

- Table 5.1: Sensitivity, specificity and accuracy of the clinical tests for Medial meniscus

	Sensitivity (%)	Specificity (%)	Accuracy (%)
Mc-Murray Test			
Modified Mc-Murray			
Joint line tenderness			

- Table 5.2: Sensitivity, specificity and accuracy of the clinical tests for Lateral meniscus

	Sensitivity (%)	Specificity (%)	Accuracy (%)
Mc-Murray Test			
Modified Mc-Murray			
Joint line tenderness			

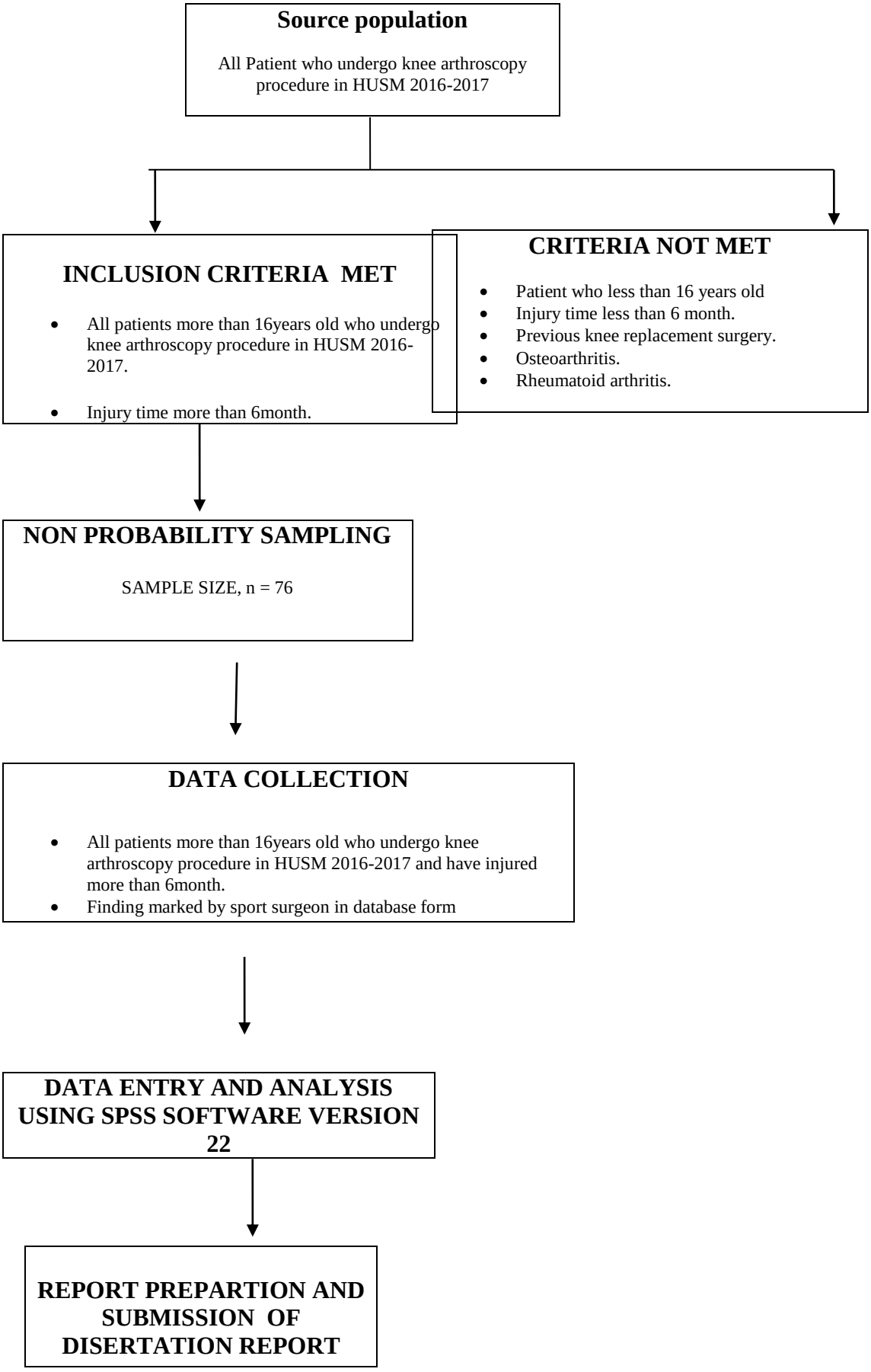
Sensitivity, specificity and accuracy were calculated as follows: Sensitivity=true positive ×100 / true positive + false negative Specificity=true negative ×100 / true negative + false positive Accuracy=true positive + true negative ×100 / total

Patient	Estimated Prevalence (%)	Positive Predictive Value (%)	100% Minus Positive Predictive Value (%)	Negative Predictive Value (%)	100% Minus Negative Predictive Value (%)

Table 6: Presenting complaint of patients and arthroscopic finding

Symptoms :	Number of Patient	%	Medial meniscus injury	Lateral Meniscus injury	Both meniscus injury	No injury
Knee pain						
Knee Swelling						
Instability						
Locking						
Total						

STUDY FLOW CHART



GANTTZ CHART

Activities	Time																								
	2015			2016												2017									
Month	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O
Research proposal																									
Correction																									
Presentation proposal at department and correction																									
Ethical presentation and approval																									
Data collection																									
Data entry																									
Data analysis																									
Write up																									
Submission And correction																									

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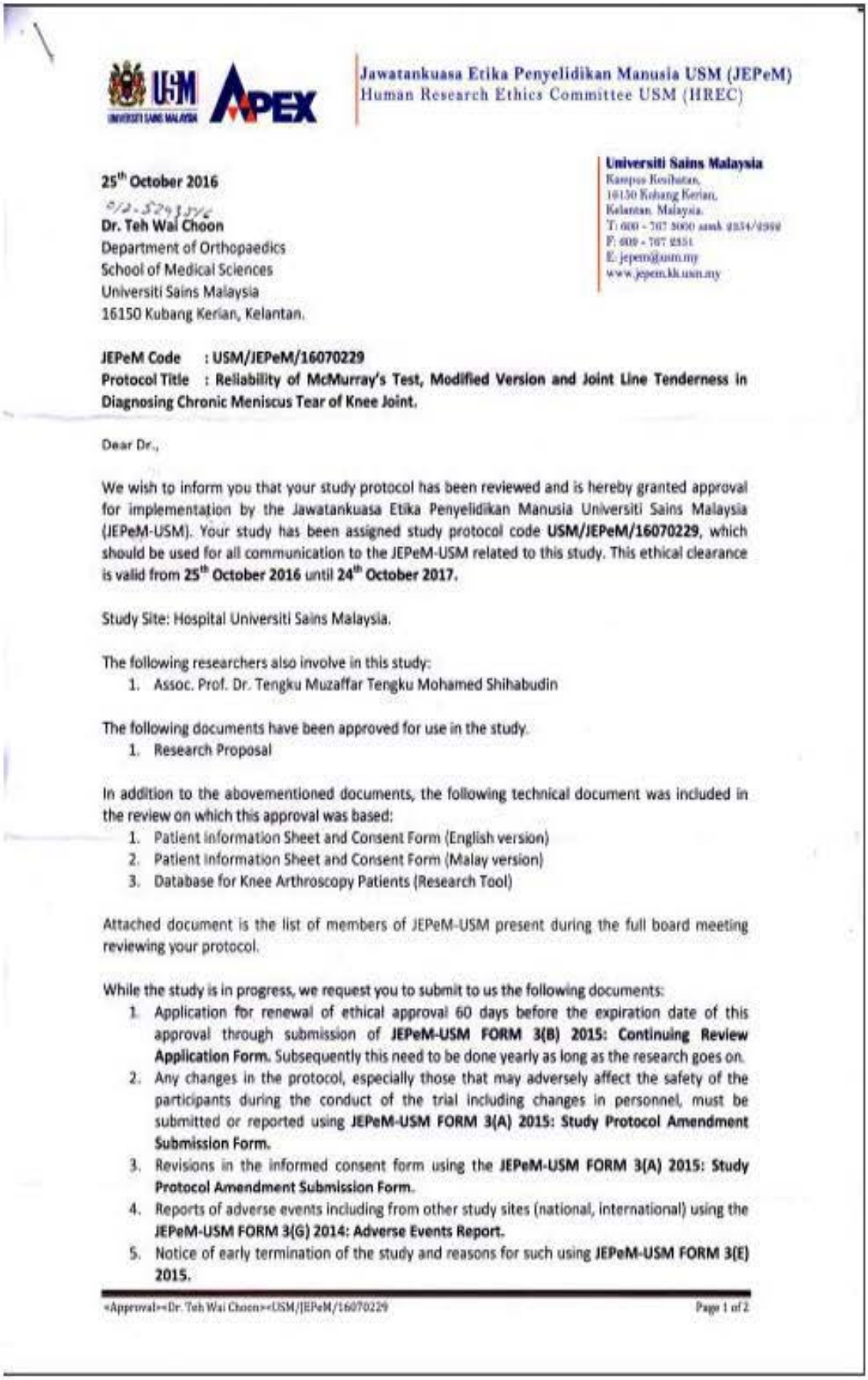
2.2 ETHICAL APPROVAL LETTERS



Jawatankuasa Etika Penyelidikan Manusia USM (JEPeM)
Human Research Ethics Committee USM (HREC)

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25th October 2016

6/2-5293/16

Dr. Teh Wai Choon
Department of Orthopaedics
School of Medical Sciences
Universiti Sains Malaysia
16150 Kubang Kerian, Kelantan.

JEPeM Code : USM/JEPeM/16070229
Protocol Title : Reliability of McMurray's Test, Modified Version and Joint Line Tenderness in Diagnosing Chronic Meniscus Tear of Knee Joint.

Dear Dr.,

We wish to inform you that your study protocol has been reviewed and is hereby granted approval for implementation by the Jawatankuasa Etika Penyelidikan Manusia Universiti Sains Malaysia (JEPeM-USM). Your study has been assigned study protocol code **USM/JEPeM/16070229**, which should be used for all communication to the JEPeM-USM related to this study. This ethical clearance is valid from **25th October 2016** until **24th October 2017.**

Study Site: Hospital Universiti Sains Malaysia.

The following researchers also involve in this study:

1. Assoc. Prof. Dr. Tengku Muzaffar Tengku Mohamed Shihabudin

The following documents have been approved for use in the study.

1. Research Proposal

In addition to the abovementioned documents, the following technical document was included in the review on which this approval was based:

1. Patient Information Sheet and Consent Form (English version)
2. Patient Information Sheet and Consent Form (Malay version)
3. Database for Knee Arthroscopy Patients (Research Tool)

Attached document is the list of members of JEPeM-USM present during the full board meeting reviewing your protocol.

While the study is in progress, we request you to submit to us the following documents:

1. Application for renewal of ethical approval 60 days before the expiration date of this approval through submission of **JEPeM-USM FORM 3(B) 2015: Continuing Review Application Form.** Subsequently this need to be done yearly as long as the research goes on.
2. Any changes in the protocol, especially those that may adversely affect the safety of the participants during the conduct of the trial including changes in personnel, must be submitted or reported using **JEPeM-USM FORM 3(A) 2015: Study Protocol Amendment Submission Form.**
3. Revisions in the informed consent form using the **JEPeM-USM FORM 3(A) 2015: Study Protocol Amendment Submission Form.**
4. Reports of adverse events including from other study sites (national, international) using the **JEPeM-USM FORM 3(G) 2014: Adverse Events Report.**
5. Notice of early termination of the study and reasons for such using **JEPeM-USM FORM 3(E) 2015.**

6. Any event which may have ethical significance.
7. Any information which is needed by the JEPeM-USM to do ongoing review.
8. Notice of time of completion of the study using **JEPeM-USM FORM 3(C) 2014: Final Report Form.**

Please note that forms may be downloaded from the JEPeM-USM website: **www.jepem.kk.usm.my**

Jawatankuasa Etika Penyelidikan (Manusia), JEPeM-USM is in compliance with the Declaration of Helsinki, International Conference on Harmonization (ICH) Guidelines, Good Clinical Practice (GCP) Standards, Council for International Organizations of Medical Sciences (CIOMS) Guidelines, World Health Organization (WHO) Standards and Operational Guidance for Ethics Review of Health-Related Research and Surveying and Evaluating Ethical Review Practices, EC/IRB Standard Operating Procedures (SOPs), and Local Regulations and Standards in Ethical Review.

Thank you.

"ENSURING A SUSTAINABLE TOMORROW"

Very truly yours,

PROF. DR. HANS AMIN VAN ROSTENBERGHE
Chairperson
Jawatankuasa Etika Penyelidikan (Manusia) JEPeM
Universiti Sains Malaysia

Jawatankuasa Etika Penyelidikan Manusia USM (JEPeM)
Human Research Ethics Committee USM (HREC)

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Date of meeting : 16th August 2016
Venue : Meeting Room, Division of Research & Innovation, USM Kampus Kesihatan.
Time : 9.00 a.m – 3.00 p.m
Meeting No : 341

Members of Committee of the Jawatankuasa Etika Penyelidikan (Manusia), JEPeM Universiti Sains Malaysia who reviewed the protocol/documents are as follows:

Member (Title and Name)		Occupation (Designation)	Male/ Female (M/F)	Tick (✓) if present when above items, were reviewed
Chairperson : Professor Dr. Hans Amin Van Rostenberghe		Chairperson of Jawatankuasa Etika Penyelidikan (Manusia), JEPeM USM	M	✓ (Chairperson)
Secretary: Mr. Mohd Bazlan Hafidz Mukrim		Research Officer	M	✓
Members :				
1.	Dr. Azlan Husin	Lecturer, School of Medical Sciences	M	✓
2.	Assoc. Prof. Dato' Al-Ustaz Hj. Ellas Zakaria	Lecturer, School of Humanities	M	✓
3.	Mr. Hj. Ismail Hassan	Community Representative	M	✓
4.	Dr. Mohammad Farris Iman Leong Abdullah	Lecturer, Advanced Medical and Dental Institute (AMDI)	M	✓
5.	Professor Dr. Naraziah Mohd Yusoff	Lecturer, Advanced Medical and Dental Institute (AMDI)	F	✓
6.	Professor Dr. Nik Hazlina Nik Hussain	Lecturer, School of Medical Sciences	F	✓
7.	Mrs. Norleha Mohd Noor	Non-scientific member (Institutional)	F	✓
8.	Associate Professor Siti Hawa Ali	Lecturer, School of Health Sciences	F	✓
9.	Dr. Teguh Haryo Sasongko	Lecturer, Human Genome Centre	M	✓
10.	Mrs. Zawiah Abu Bakar	Community Representative	F	✓
11.	Professor Dr. Zeehaida Mohamed	Lecturer, School of Medical Sciences	F	✓

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PROFESSOR DR. HANS AMIN VAN ROSTENBERGHE
Chairperson
Jawatankuasa Etika Penyelidikan (Manusia), JEPeM
Universiti Sains Malaysia

CHAPTER 3: MANUSCRIPT

Accuracy of McMurray's Test, Modified Version and Joint Line Tenderness in Diagnosing Chronic Meniscus Tear in Knee Joint

Teh Wai Choon , MD, **Tengku Muzaffar** , MMed Orth

Faculty of Orthopedics, Hospital Universiti Sains Malaysia , Kelantan , Malaysia