

Chinese Whispers: A brief history of eponymous orthopaedic examinations

Journal of Orthopaedics,
Trauma and Rehabilitation
1–4© The Author(s) 2020
Article reuse guidelines:
sagepub.com/journals-permissions
DOI: 10.1177/2210491720953605
journals.sagepub.com/home/otr

Emily L Humphries¹ , Felix Allen², Simon Grange³,
Andrew Goldberg⁴ and Peter Smitham⁵

Abstract

Eponymous orthopaedic examinations frequently appear in modern clinical examinations, yet their original description and cause for change are often omitted from medical education today. This is important to appreciate in order to understand their diagnostic relevance in modern medicine and subsequent interpretation of results by fellow clinicians. This article reviews the original description of these tests by their namesakes, how they have evolved over time and their relevance in orthopaedics today. An online literature review (PubMed) was conducted of the original descriptions and other published literature detailing their history, evolution, sensitivity and specificity. While elements of these tests have been lost naturally over time to the ‘Chinese Whispers’ effect, most have evolved positively secondary to a deepening anatomical and pathological understanding of their target conditions. They retain some usefulness in clinical medicine, however it is recognized that their diagnostic value is invariably supplanted by improvements in diagnostic imaging.

Keywords

Clinical, eponymous, examinations, orthopaedic

Date received: 31 May 2020; accepted: 4 August 2020

Introduction

Eponymous tests, signs and conditions are often associated with the individual who first described them. From Barlow’s manoeuvre through to Ortolani’s test and O’Donoghue’s triad, the names with which these tests are associated are well known today even if the description of test has evolved with time. These tests may become significantly altered from those that were first described. We reviewed the original description of a number of commonly used eponymous examinations in orthopaedics and determined how these descriptions have been altered over time, through ‘Chinese Whispers’ or through increasing understanding of anatomy and pathology of relevant conditions.

The hip

Thomas’ hip flexion test

Hugh Owen Thomas (1834–1891) was a Welsh orthopaedic surgeon, the descendent of a long line of Welsh bone-setters and a student of medicine at The University of Edinburgh and University College London.¹ Dubbed ‘the

Father of Orthopaedic Surgery’, Thomas described a test in 1875 to detect fixed flexion deformities of the hip in chronic joint disease. He noted that his test was advantageous as it did not rely on the cooperation of the patient or require an anaesthetic. His original description was of particular use in the paediatric population to detect fixed flexion deformities secondary to tuberculosis (TB) joint disease.² Nowadays, Thomas’ test is invariably used in the geriatric population affected by osteoarthritis to assess fixed flexion deformity.

¹ Department of Orthopaedics and Trauma, Royal Adelaide Hospital, South Australia, Australia

² Dartford and Gravesham NHS Trust, Darent Valley Hospital, Dartford, Kent, UK

³ Zayed Military Hospital, Abu Dhabi, United Arab Emirates

⁴ Royal National Orthopaedic Hospital, Brockley Hill, Stanmore, UK

⁵ Royal Adelaide Hospital, Adelaide, SA, Australia

Corresponding author:

Emily L Humphries, Department of Orthopaedics and Trauma, Royal Adelaide Hospital, Port Road, South Australia 5000, Australia.
Emails: emily.humphries@sa.gov.au; emilyhumphries2504@gmail.com



Creative Commons Non Commercial CC BY-NC: This article is distributed under the terms of the Creative Commons

Attribution-NonCommercial 4.0 License (<https://creativecommons.org/licenses/by-nc/4.0/>) which permits non-commercial use, reproduction and distribution of the work without further permission provided the original work is attributed as specified on the SAGE and Open Access pages (<https://us.sagepub.com/en-us/nam/open-access-at-sage>).

In addition to a shift in the target demographic, the description of the test has also been modified over time. Modern textbooks describe one of the two methods. The first method involves bringing both hips into maximal flexion simultaneously, to obliterate the lumbar lordosis, before releasing the affected hip and noting any inability of the affected leg to fully extend. The second technique requires flexing the unaffected leg off the couch until the lumbar lordosis disappears and noting whether the affected side also lifts off the examination couch. The latter method is similar to the original description by Thomas in which the unaffected leg was brought to the chest and held by an assistant.³ The patient was then asked to extend their affected leg; the degree to which the patient was able to extend varied depending on the severity of the disease. According to Thomas, this extension produced a rigid cord at the origin of the adductors which is a key element of the test lost in history. To confirm the nature of the deformity, Thomas describes that forcible extension of the joint by the surgeon should produce pain.² This is another original description of the test that has since been removed; perhaps rightly so, as aiming to cause pain to the patient is no longer acceptable. The unaffected leg is then released and maximal extension of the affected leg is maintained; this produces compensatory lumbar lordosis. The angle of this lordosis was used by Thomas to estimate the duration of the malady; for example, he described that an angle of 170° equated to a disease process of 6 weeks and an angle of 100° suggested a duration of 9 months.² Like other aspects of the original illustration, this description has been discontinued for several reasons. Skeletal TB is no longer common, most 'modern' patients suffer from osteoarthritis and average life expectancy has more than doubled since early Victorian England; emphasis is now placed on quality of life and the implications of surgical interventions.

Thomas' hip flexion test has been modified throughout history due to both the 'Chinese Whispers' effect and advances in modern orthopaedic medicine. The validity of Thomas' test has come under question due to considerable variability in the examiner's technique, affecting results and definitions of pass/fail scoring.⁴ Despite a sensitivity of 31.82% and specificity of 57.14% for fixed flexion deformities, it is still frequently used in clinical practice today.⁵

Trendelenburg's test

Friedrich Trendelenburg (1844–1924) was a German surgeon who initially worked as an anatomy assistant in Glasgow and later studied medicine in his hometown of Berlin. His name is associated with many tests, descriptions and equipment in surgery, however in the realm of orthopaedic surgery he is best known for the Trendelenburg position and Trendelenburg gait description.⁶ In Trendelenburg's era the 'swaying gait' of patients, typically suffering from developmental dysplasia of the hip (DDH), was understood

to be secondary to abnormal mobility of the femoral head within the acetabulum. After closely examining the gait of his patients Trendelenburg determined this was not the case. He observed that although the upper body tilted towards the stance leg during the gait cycle, the pelvis on the opposite side tilted downwards, opposing the idea of the dislocation of the hip on the stance leg. He noticed this gait abnormality also occurred in progressive muscular dystrophy patients, resulting from paresis of the gluteal muscles.⁶ In addition to the abnormal gait, Trendelenburg also illustrates the mechanics of the normal gait cycle. When one foot is raised off the ground, the body swings to shift the centre of gravity above the stance leg, with the pelvis remaining horizontal due to the stabilising action of the hip abductors on the stance side.⁷ He compares this action in a girl suffering from bilateral DDH:

...The girl has to support herself slightly with her hands... the pelvis hangs down on the swinging side and the upper part of the body leans far over to the standing side.⁷

Hardcastle and Nade suggested a modification to the examination beyond gait assessment for further evaluation of hip abductor pathology.⁸ The examiner stands behind the patient who is asked to raise each foot and elevate their pelvis for 30 seconds. In the healthy patient, the unsupported side will remain level or rise slightly. In patients with weak abductors, the pelvis will drop to the unsupported side or in severe cases the patient will lean towards the affected side. Hardcastle and Nade also stressed the importance of timing for 30 seconds as it allows for detection of a delayed Trendelenburg-positive test. This modification is still utilised today in clinical practice and serves to assess the identification of hip abductor pathology.⁸

The original gait description by Trendelenburg was criticised as being too vague, leading to wide variation in the interpretation and conduction of the test. Hardcastle and Nade suggested a standardised method of performing and interpreting the Trendelenburg hip abductor test which has been a positive change for clinicians. Trendelenburg's original impressions and interpretations were valid but required more detail and standardisation to facilitate accurate examination in the clinical setting.

Knee

McMurray's test

The McMurray's test is named after Thomas Porter McMurray (1887–1949), a British orthopaedic surgeon who graduated from Queen's University, Belfast, in 1910. He worked in a junior surgical position in Liverpool, served as a Captain in the Royal Army Medical Corp. in France and returned to Alder Hey Military Hospital in Liverpool in 1914, where he became their first professor of orthopaedic surgery in 1938.⁹

The McMurray's test is first described in his article 'The Diagnosis of Internal Derangements of the Knee' in 1928. He recognised that a tear of the internal semilunar cartilage, now known as the medial meniscus, had symptoms similar to that of a periarticular strain with additional symptoms of locking, inability to straighten the knee and pain on palpation and under valgus strain. To aid differentiation between a meniscal tear and a strain, McMurray described the following test:

The knee should be flexed completely, so that the heel rests on the buttock or as near this point as possible: the ankle is then grasped in the right hand, and the joint controlled by the left hand with the thumb and forefinger firmly grasping it on either side at the level of the joint to its posterior aspect, and behind the external and internal lateral ligaments respectively. The ankle is now twisted by the right hand, so that the knee is rotated inwards and outwards to its fullest extent, and if a lesion of the external cartilage or posterior portion of the internal cartilage is present a definite click can be felt.¹⁰

McMurray's 1942 article titled 'The Semilunar Cartilages' adds to his original description by describing the alteration in flexion of the knee during the test to examine the entirety of the menisci from posterior to anterior. McMurray suggested that the examination be conducted twice, once with the foot in internal rotation to examine the lateral meniscus and again in external rotation to examine the medial meniscus. Today the test has been modified, so examiners examine both menisci at once by altering the rotation of the leg while gradually extending the knee. McMurray describes a positive test with more detail in his 1942 article:

When a loose segment of the cartilage is caught between the bones during the rotation, the sliding of the femur over the loose fragment is accompanied by a thud or click, which can sometimes be heard but can always be felt, and the size of the detached portion can be judged by the rocking of the tibia, and usually also by the severity of the sound produced.¹¹

While pain is not a prominent feature described by McMurray in his description of the test, he does note that a useful method of distinguishing the click produced by lax cartilage from the click produced by torn cartilage is the presence of pain in the latter condition. He also comments on the correlation between the click and the severity of the disease:

To the best of my knowledge, the severity of the sound is not now used to determine the extent of the tear.¹¹

There have been a number of articles evaluating the usefulness of McMurray's test in diagnosing meniscal pathology, most published in the mid-1900s. A more recent article in 2009 reported a diagnostic accuracy of 57% of medial meniscus and 77% for lateral meniscus in

McMurray's test. This is comparable to the Thessaly test and inferior joint line tenderness test, however combination of the joint line tenderness test and McMurray's test yields the highest diagnostic accuracy.¹²

Lachman test

John Lachman (1919–2007) was an American orthopaedic surgeon who completed his medical training and orthopaedic residency at Temple University in Philadelphia. He became Professor and the Chairman of the Department of Orthopaedic Surgery at Temple University in 1956. Lachman observed that patients with tears of the anterior cruciate ligament (ACL) demonstrated passive anterior subluxation of the tibia in relation to the femur when supine.¹³ On further examination, Lachman not only demonstrated that the instability of the ACL could be exaggerated by applying force to the extended knee but also recognised that this technique was more sensitive than the anterior drawer test. Lachman himself did not name the test; a surgeon trained by Lachman named Joseph Torg described the test at the annual meeting of the American Orthopaedic Society in 1976 and named it in honour of his mentor in his published article the same year:

The examination is performed with the patient lying supine on the table with the involved extremity on the side of the examiner. With the patient's knee held between full extension and 15-degree flexion, the femur is stabilized with one hand while firm pressure is applied to the posterior aspect of the posterior tibia in an attempt to translate it anteriorly. A positive test indicating disruption of the anterior cruciate ligament is one which there is one in which there is... a characteristic "mushy" or "soft" end point.¹⁴

Lachman never professed to be the original descriptor of the technique; a literature review reveals that SJ Ritchey described a similar test in 1960.¹⁵

The mechanics of the Lachman test require the examiner to have large hands to grip the distal thigh and proximal lower leg with enough strength to stress the knee. This is problematic for many and this was initially modified in 1990 to include two examiners to conduct the test.¹⁵ A further modification was made in 1994 to facilitate the performance of the Lachman test by a single examiner with ease, in both the hospital and sports setting. Whitehill et al. described the modified Lachman test in two ways. The first method involves the patient positioned supine on the examination table with the affected knee at the edge of the table and the lower leg hanging below with the patient's foot resting on the examiner's thigh to relieve tension on the ACL. The right hand is placed on the distal thigh to stabilise it and the left hand is cupped around the proximal lower leg and force is applied in the anterior plane. The second modification is designed for the sports setting and involves the patient positioned supine on the ground, with a rolled

towel or similar item placed beneath the affected knee for support. The hand placements are the same as described in the first modification and the ground acts to stabilise the patient's heel. This modification yields the same sensitivity and specificity as the original Lachman test.¹⁶

The Lachman test (original and modified) is accepted as a reliable clinical examination for ACL injury with one meta-analysis reporting a sensitivity of 86% and specificity of 91%, which improves under anaesthesia.¹⁵ The modification simply serves to facilitate ease of examination for all clinicians. This is superior to the anterior drawer test – the pivot shift test demonstrates superior specificity only.¹⁷

Conclusion

The clinicians for whom these examinations are named originally described these tests to aid fellow practitioners in making a correct clinical diagnosis. This was during a time where they had little more than their hands to aid them and the risk of litigation and high patient load were not an issue. Aspects of these examinations have been lost due to the 'Chinese Whispers' effect however, for the most part, they have evolved secondary to our deepening understanding of the anatomy and pathology of these conditions and research outcomes on their sensitivity and specificity. We must remember that these eponymous tests are named so for a reason; appreciation of the history of these examinations is required to understand their usefulness and limitations in a world where dynamic imaging will eventually supersede their use.


Declaration of conflicting interests


The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

Funding

The author(s) received no financial support for the research, authorship, and/or publication of this article.

ORCID iD

Emily L Humphries  <https://orcid.org/0000-0002-1440-2620>

Andrew Goldberg  <https://orcid.org/0000-0002-8650-4503>

References

1. Le Vay D. *The life of Hugh Owen Thomas*. Edinburgh: E and S Livingstone Ltd, 1956.
2. Thomas HO. *Diseases of the hip, knee and ankle joints: treated by a new and efficient method*. 2nd ed. Liverpool: T. Dobb & Co, 1876.
3. Wren S and Ashwood N. The life and times of Hugh Owen Thomas. *Trauma* 2010; 12(4): 197–201.
4. Peeler J and Anderson JE. Reliability of the Thomas test for assessing range of motion about the hip. *Phys Ther Sport* 2007; 8(1): 14–21.
5. Vigotsky AD, Lehman G, Beardsley C, et al. The modified Thomas test is not a valid measure of hip extension unless pelvic tilt is controlled. *Peer J* 2016; 4: e2325.
6. Bernstein A, Koo HP and Bloom DA. Beyond the Trendelenburg position: Friedrich Trendelenburg's life and surgical contributions. *Surgery* 1999; 126(1): 78–82.
7. Trendelenburg F. Trendelenburg's test. *Clin Orthop Relat Res* 1998 (original work published 1895); 355: 3–7.
8. Hardcastle P and Nade S. The significance of the Trendelenburg Test. *J Bone Joint Surg Br* 1985; 67(5): 741–742.
9. McFarland B. *The life and work of Thomas Porter McMurray*. Liverpool: Liverpool University Press, 1958.
10. Gugliotti M and Storic L. The McMurray's test – a historical perspective. *J Physiother Rehabil* 2018; 2(1): 1–2.
11. McMurra TP. The semilunar cartilages. *Br J Surg* 1940; 29(116): 407–414.
12. Konan S, Rayan F and Haddad F. Do physical diagnostic tests accurately detect meniscal tears? *Knee Surg Sports Traumatol Arthrosc* 2009; 17(7): 806–811.
13. Paessler HH and Michel D. How new is the Lachman Test? *Am J Sports Med* 1992; 20(1): 95–98.
14. Torg JS, Conrad W and Kalen V. Clinical diagnosis of anterior cruciate ligament instability in the athlete. *Am J Sports Med* 1976; 4(2): 84–93.
15. Draper DO. A comparison of stress tests used to evaluate the anterior cruciate ligament. *Phys Sportsmed* 1990; 18(1): 89–96.
16. Whitehill W, Wright K and Nelson K. Modified Lachman test for anterior cruciate ligament stability. *J Athl Train* 1994; 29(3): 256–257.
17. Prins M. The Lachman test is the most sensitive and the pivot shift the most specific test for the diagnosis of ACL rupture. *Aust J Physiother* 2006; 52(1): 66.