The Association Study Between MRI and Percutaneous Transpedicular Biopsy (HPE) findings in Vertebral Lesions

By:

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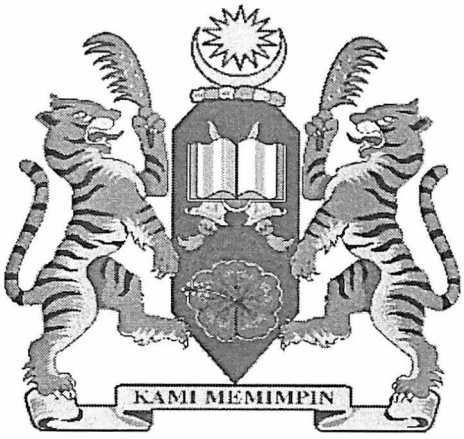

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Study Venue : Hospital Kuala Lumpur
HUSM

From January 2002 to December 2007

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TABLE OF CONTENT

Specially Dedicated To

My Wife

Fazlina Ahmad
&

My Children

NAJWA ASYILAH
DANIEL FARIS

For Their Love and Support

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 and also during whole program of Master in Medicine (Orthopaedics)

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- **Everybody,** shares their idea and help in completing this dissertation.

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Abstract

Introduction

Magnetic resonance imaging (MRI) has become the instrument of choice for disease detection in spine pathology. More recent report have questioned the specificity of MRI detection and concluded that signal intensity change alone is not diagnostic of metastatic lesion. The introduction of percutaneous biopsy has substantially benefited the diagnosis of skeletal disease. It avoids the need for open surgical biopsy in most patients. Percutaneous transpedicular biopsy for vertebral lesions can be performed with minimal morbidity and good diagnostic yield with accuracy up to 92% in bone metastases (Ryohei Ashizawa et al,1999).

Objectives

Our main objective is to determine the sensitivity and specificity of MRI in disease detection for vertebral spinal lesion specifically in vertebral tuberculosis and metastases. The association between MRI findings were made with transpedicular biopsy findings (histopathological diagnosis). The secondary objective was to determine the correlation of transpedicular biopsy done under C-arm fluoroscopy with respect to major influencing variables such as spinal level, tissue type (lytic and sclerotic) and ultimate tissue pathologic diagnosis (HPE).

Method

In this retrospective study case series, we reviewed 72 patients admitted to our orthopaedic department in Hospital Kuala Lumpur and Hospital University Science, Malaysia between January 2002 to December 2007. All patients with suspected case of metastases, tuberculosis and pyogenic disease based on their clinical sign, symptoms and Xray findings involving spinal vertebra who underwent MRI and percutaneous transpedicular biopsy were included in the study. The data collected were reviewed and all data pertaining to laboratory investigations i.e FBC (full blood count), ESR (erythrocyte sedimentation rate), tumor marker, Sputum AFB (acid fast bacilli), Mantoux test and PCR (polymerase chain reaction) to assist in disease confirmation were taken to support for clinical diagnosis. The MRI findings of each cases reported by radiologist were reviewed to get radiological diagnosis. The HPE result from the tissues taken through percutaneous transpedicular biopsies procedure which were performed later to MRI to obtain histopathological diagnosis for final disease confirmation were reviewed. The data obtained were analysed for association.

Results

The overall HPE diagnosis obtained for disease detection through transpedicular biopsy were 65% positive (forty seven of seventy two) and negative 34.5% (twenty five of seventy two) for both vertebral tubeculosis and metastases.The overall disease detection by MRI were 97.2% (seventy of seventy two). There

was no significant association between MRI findings with percutaneous transpedicular biopsy (HPE) (*p value* >0.05) for disease detection. From overall study population, the prevalence of disease detected by percutaneous transpedicular biopsy was 0.653 (95%CI 0.543, 0.763) and the prevalence of similar disease detected by MRI was 0.972 (95% CI 0.934,1.011). The sensitivity and specificity of magnetic resonance imaging (MRI) to detect the disease compared to percutaneous transpedicular biopsy which was taken as gold standard in this study were 0.979 (95% CI 0.937,1.020) and 0.040 (95% CI 0.018, 0.062) respectively. With respect to vertebral level, there was significant association between level of vertebra lesion involved with HPE diagnosis in percutaneous transpedicular biopsy procedure (*p* value 0.021). For tissue type, there was no significant association between tissue type in vertebral body lesion with HPE obtained through transpedicular biopsy procedure (*p* value 0.256).

Conclusion

Based on this study, we can conclude that MRI is highly sensitive for disease detection in vertebral lesion. The MRI however has low specificity and not reliable in detecting true negative disease. There is no significant association between MRI and transpedicular biopsy method for disease detection. For inconclusive MRI findings, transpedicular biopsy is clinically useful and reliable to confirm the vertebral disease. For obvious MRI finding with vertebral metastases and tuberculosis, transpedicular biopsy is reliable for confirmation disease diagnosis.

Keyword

Magnetic Resonance Imaging (MRI), Transpedicular biopsy,

Abstrak

Pengenalan

Magnetic resonance imaging (MRI) telah mejadi satu alat pilihan untuk mengesan peyakit di bahagian tulang belakang. Lapuran terkini telah mempersoalkan kebolehan MRI dari segi 'specifisity' untuk mengesan peyakit dan telah merumuskan bahawa pertukaran dari segi signal sahaja adalah tidak dianggap satu kebolehan untuk mengenalpasti penyakit kanser menular ke bahagian 'vertebra'. Pengambilan tisu secara teknik ' percutaneous' telah memberi faedah besar dalam diagnosa penyakit yang melibatkan system tulang. Teknik pengambilan tisu melalui tulang 'pedicle' (transpedicular) untuk penyakit tulang 'vertebra' boleh dijalankan dengan komplikasi kecederaan yang minima dan hasil diagnosanya tepat sehingga kadar ketepatan 92% (Ryohei Ashizawa et al,1999).

Tujuan

Tujuan utama kajian ini adalah untuk menentukan 'sensitiviti' dan 'specifisiti' MRI dalam tugas mengesan penyakit yang melibatkan 'tulang vertebra', khasnya untuk penyakit 'tuberkulosis vertebra' dan kanser menular di bahagian vertebra. tisu tulang 'vertebra' dengan faktor-faktor seperti kedudukan paras 'vertebra' terlibat, jenis jenis tisu dan tisu diagnosa secara keseluruhannya.

Kaedah/Cara

Ini adalah kajian 'retrospective' di antara Januari tahun 2002 hingga Disember 2007. Pihak kami telah memeriksa seramai 72 pesakit yang telah dimasukkan ke dalam wad orthopedik di Hospital Kuala Lumpur dan Hospital Universiti Sains Malaysia. Semua pesakit yang di khuatiri mengalami penyakit 'tuberkulosis' dan kanser 'vertebra' berdasarkan tanda – tanda penyakit secara klinikal, gambar xray yang telah melalui proses MRI dan pengambilan tisu di bahagian 'vertebra' secara teknik ' transpedicular' adalah di masukkan dalam kajian.

Keputusan

Diagnosa keseluruhan untuk histopathologi atau HPE untuk penyakit yang dikesan melalui kaedah 'transpedicular' biopsi adalah 68% positif (empat puluh tujuh daripada tujuh puluh dua kes) dan negatif 34.5% (dua puluh lima daripada tujuh puluh dua kes). Kedua dua adalah untuk keputusan penyakit 'tuberculosis' dan kanser yang merebak ke bahagian 'vertebra'. Keseluruhan penyakit yang di kesan oleh MRI adalah 97.2% (tujuh puluh daripada tujuh puluh dua kes). Dengan ini tiada perkaitan di antara keputusan MRI dibandingkan dengan keputusan HPE – *P* value >0.05 untuk kaedah mengesan penyakit. Daripada keseluruhan populasi, penyakit yang telah dikesan oleh pengambilan tisu kaedah 'transpedicular' adalah 0.653 (95%CI 0.543, 0.763) dan taburan penyakit yang sama yang dikesan oleh kaedah MRI adalah 0.972 (95% CI 0.934, 1.011). Untuk 'sensitiviti' dan 'specifisiti' MRI dalam kebolehan mengesan penyakit

seperti yang di sebut di atas dibandingkan dengan pengambilan tisu kaedah ' transpedicular' yang di anggap sebagai 'gold standard' dalam kajian ini adalah 0.979 (95% CI 0.937,1.020) and 0.040 (95% CI 0.018,0.062) masing masing. Berkaitan dengan kajian melibatkan bahagian 'vertebra', tiada kaitan secara langsung antara bahagian 'vertebra' terlibat dengan diagnosa 'HPE' (*p* value 0.021). Untuk kajian jenis tisu, juga tiada kaitan secara langsung antara jenis tisu dengan diagnosa 'HPE' yang diambil menerusi kaedah 'transpedicular' (p value 0.256).

Rumusan

Untuk rumusan, MRI adalah sangat 'sensitif' and di percayai untuk mengesan penyakit yang melibatkan 'vertebra'. Sebaliknya, MRI mempunyai 'spesifisiti' yang rendah dan tidak boleh dipercayai untuk mengesan penyakit yang benar benar negatif. Tiada kaitan secara langsung di antara keputusan MRI dengan kaedah pengambilan tisu 'vertebra' secara ' transpedicular'. Untuk keputusan MRI yang 'tidak dapat dirumuskan- inconclusive', kaedah pegambilan tisu secara 'transpedicular' adalah diperlukan secara klinikal dan kaedah ini boleh dipercayai untuk memastikan penyakit di bahagian 'vertebra'. Untuk keputusan MRI yang jelas diagnosanya, kaedah pengambilan tisu secara 'transpedicular' adalah juga perlu untuk mengetahui ketepatan diagnosanya.

Keyword

Magnetic Resonance Imaging (MRI), kaedah pengambilan tisu secara 'transpedicular'

1.0 Introduction

In the mid 1980, magnetic resonance imaging (MRI) has become the instrument of choice for disease detection in spine pathology. More recent report have questioned the specificity of MRI for disease detection and concluded that signal intensity change alone is not diagnostic of metastastic spinal lesion. Lee et al, (1999) however report a 95% and 98% accuracy respectively in differentiating between benign and malignant compression fracture and vertebral osteomyelitis on MRI. While the confidence should be in MRI diagnosis of vertebral lesion, the confirmation through vertebral biopsy material is indicated when radiographic modalities fail to provide a correct diagnosis.

On the other hand, the introduction of percutaneous biopsy has substantially benefited the diagnosis of skeletal lesions. It avoids the need for open surgical biopsy in most patients. It has been reported that percutaneous biopsy of the spine has been performed successfully for more than 60 years (Robertson RC, Ball RP,1935). It is a key steps in the diagnosis of neoplastic, infectious, tumor-like musculoskeletal lesions. As generally known, percutaneous biopsy of neoplasm help facilitates accurate grading, staging and treatment planning. Open surgical biopsies however, have been the traditional and gold standard for obtaining adequate and representative samples for diagnosis of musculoskeletal lesions.