行政院及所屬各機關出國報告

（　出國類別：進修　）

美國研習骨骼肌肉系統放射線影像學心得報告

服務機關：台北榮民總醫院

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出國地區：　美　　國

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行政院輔導會臺北榮民總醫院

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出國類別: 進修

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關鍵詞: 骨骼肌肉放射線學

內容摘要: 前言: 加強本身放射線學及磁振造影影像學的診斷能力與水平，充實知識，進而提升報告的品質及診斷率、檢查技巧，實屬必要，同時也會對本院放射線部有所助益。 目的: 1. 擴大視野 2. 進修骨骼關節肌肉系統一般放射影像學 3. 進修骨骼肌肉系統磁振造影影像學 4. 學習骨骼肌肉放射線學介入性(interventional)檢查 5. 學習研究計劃的方法與技巧 過程: 請詳見內文 心得: 1.整合療體系合作更可以作更多的研究發展，當然也可以獲得更多的醫療資源去造福病人。 2. 職在美國進修期間在骨關節磁振造影的訓練每日閱片包括再教育進修課程相當紮實，骨關節磁振造影已經是骨關節放射線學的主流，其應用可以全方位去思考，去發展。 2. 骨關節磁振造影往後的一個重要趨勢是術後影像評估 3.小關節磁振造影有很大的開發空間。 4. 需更廣泛介紹磁振造影在各領域的應用優點。 5. 職在美國進修期間共完成四篇文章並投稿，其中二篇被北美放射線學會大會接受口頭發表報告，另一篇並獲得美國放射線醫學會的接受將作口頭報告，今後須在本院研究方面繼續努力。 6. 骨骼肌肉放射線學介入性(interventional)檢查治療的繼續推展。 建議: 1. 積極努力提高本院的知名度。 2. 建立擴大榮總系統建立良好的機制及溝通管道，吸收更多醫院加入本院系統。 3.建議繼續增購磁振造影檢查。 4. 加強與陽明大學基礎研究方面的合作。 5. 鼓勵臨床醫師多認識磁振造影的優點。

出國進修骨骼肌肉系統放射線影像學

內容提要

前言:

加強本身放射線學及磁振造影影像學的診斷能力與水平，充實知識，進而提升報告的品質及診斷率、檢查技巧，實屬必要，同時也會對本院放射線部有所助益。

目的:

1. 擴大視野
2. 進修骨骼關節肌肉系統一般放射影像學
3. 進修骨骼肌肉系統磁振造影影像學
4. 學習骨骼肌肉放射線學介入性(interventional)檢查
5. 學習研究計劃的方法與技巧

過程:

請詳見內文

心得:

1.整合療體系合作更可以作更多的研究發展，當然也可以獲得更多的醫療資源去造福病人。

2. 職在美國進修期間在骨關節磁振造影的訓練每日閱片包括再教育進修課程相當紮實，骨關節磁振造影已經是骨關節放射線學的主流，其應用可以全方位去思考，去發展。

2. 骨關節磁振造影往後的一個重要趨勢是術後影像評估

3.小關節磁振造影有很大的開發空間。

4. 需更廣泛介紹磁振造影在各領域的應用優點。

5. 職在美國進修期間共完成四篇文章並投稿，其中二篇被北美放射線學會大會接受口頭發表報告，另一篇並獲得美國放射線醫學會的接受將作口頭報告，今後須在本院研究方面繼續努力。

6. 骨骼肌肉放射線學介入性(interventional)檢查治療的繼續推展。

建議:

1. 積極努力提高本院的知名度。

2. 建立擴大榮總系統建立良好的機制及溝通管道，吸收更多醫院加入本院系統。

3.建議繼續增購磁振造影檢查。

4. 加強與陽明大學基礎研究方面的合作。

5. 鼓勵臨床醫師多認識磁振造影的優點。

出國進修骨骼肌肉系統放射線影像學

前言:

本院放射線部骨骼關節科的例行檢查包括:一般 X 光素片外還有電腦斷層及介入性檢查，例如：關節攝影、電腦斷層定位切片檢查等等。磁振造影在骨骼肌肉系統的應用已極爲普遍及實用，職雖然在骨骼肌肉系統一般放射線學及磁振造影影像學上達某一階段的水準，但加強本身的診斷能力與水平，充實知識，進而提升報告的品質及診斷率、檢查技巧，實屬必要，同時也會對本院放射線部有所助益。

目的:

1. 擴大視野:至世界先進國家體驗觀察醫院的體系，比較其與台灣的不同及優點與缺點。
2. 進修骨骼關節肌肉系統一般放射影像學，例如 X 光素片、電腦斷層影像的判讀及知識，提升骨骼肌肉系統一般放射線影像學的判讀能力及知識。
3. 進修骨骼肌肉系統磁振造影(Magnetic Resonance Imaging, 以下簡稱 MRI)學，例如運動醫學、脊椎影像、骨骼肌肉腫瘤、關節炎或關節病變、骨髓炎或感染等部位的病變知識、判讀能力及技巧，

提升骨骼肌肉系統磁振造影學的知識、閱片能力;提高本院放射線部的診斷率及報告品質。

4. 學習骨骼肌肉放射線學介入性(interventional)檢查，例如電腦斷層定位切片等的操作技巧及應用層面，應用於本院放射線部的檢查，提升檢查的水準。
5. 學習研究計劃的方法與技巧，加強研究發展創新提高放射線學的水準。

過程:

職於 2002 年十一月二十八日攜全家至美國進修。首先隨即參加十二月初在芝加哥舉行的北美放射線學會大會 (RSNA)。

會後十二月初轉至費城 (Philiadelphia) 湯瑪士傑佛遜大學醫院 (Thomas Jefferson University Hospital，以下簡稱傑佛遜醫院) 放射線部報到，並辦理在美國居留及安頓手續。

進入傑佛遜醫院報到以後，每天跟著兩位美國老師 Dr. Mark Schweitzer (Professor of Radiology, Chief of Musculoskeletal Section) 及 Dr. William Morrison (Associate Professor of Radiology)學習骨骼關節肌肉系統一般放射影像學，磁振造影學的判讀與診斷，以及介入性(interventional)檢查。傑佛遜醫院事實上是一個醫療體系(Medical System)，包含許多其他醫院診所，每天僅僅在骨骼肌肉系統磁振造影檢查方面包括本院及其鄰近賓州 (Pennsylvania)及美屬維京群島 (Virgin Islands)的磁振造影掃瞄就有十四台約一百病例之多。傑佛遜醫院放射部也已進入數位化影像系統 (PACS)，並不斷更新中，此為世界的趨勢。

2003 年二月 22-23 日參加傑佛遜醫院舉辦兩天 Jefferson Upper Extremity Imaging Symposium 集醫院所有骨關節放射科醫師講授肩關節，Elbow 關節，手腕關節的影像學及其臨床應用。

六月 28-29 日則參加傑佛遜醫院舉辦兩天 Jefferson Lower Extremity Imaging Symposium，內容包括下肢股關節，膝關節，踝足關節的影像學及相關疾病問題。

除了與兩位老師作實例判讀學習外也積極參與其研究計劃。作計劃之前須先通過 IRB (Institutional review board) on line 測試。通過測試之後 首先與 Dr. Schweitzer 作的主題爲"Potential MR signs of recurrent carpal tunnel syndrome" 研究磁振造影在 carpal tunnel syndrome 術後復發的診斷值及應用。另一個則爲 "Is epidural fat associated with body habitus ?" 應用磁振造影探討 Epidural fat 與肥胖的關係。

職與另一位老師 Dr. Morrison 所作的研究則是"Edematous Schmorl's Nodes on Thoracolumbar MR Imaging: Patterns and Temporal Changes" 觀察Edematous Schmorl's Nodes經過長時間在影像上的變化 以及 "The Effect of Meniscal Tear on Cartilage Loss and Osteoarthritis of the Knee: Findings on Serial MRI Examinations" 即應用磁振造影預測膝關節半月軟骨裂傷對於早期退化性關節炎的影響。

從七月開始 Dr. Schweitzer 轉至紐約的骨關節醫院(Hospital for Joint Disease, New York University Medical System) 放射部任職 Chairman，所以每週有幾天到紐約學習。紐約骨關節醫院爲紐約知名的骨科醫院，每天骨放射線科的病例較傑佛遜醫院少一些，每日約 10-20 磁振造影病例，兩醫院醫療體系也盡不同。

八月 11-15 日參加華盛頓 (Washington, DC) Armed Forces Institute of

Pathology (AFIP) 舉辦 骨關節 Radiology Pathology 五天再教育課程內容包括所有骨放射學基本的複習並與病理學對照特別是關於骨骼肌肉腫瘤學內容非常詳細。

職與兩位老師提出研究文章中有兩篇"Potential MR signs of recurrent carpal tunnel syndrome"及 Edematous Schmorl's Nodes on Thoracolumbar MR Imaging: Patterns and Temporal Changes" 被北美放射線學會大會接受口頭發表報告感到極爲榮幸。

十月 25-26 日又參加了傑佛遜醫院舉辦兩天 Jefferson Spine Imaging Symposium，內容包括機脊椎的影像學。

職於十一月下旬又去波士頓 (Boston) 麻州總醫院 (Massachusetts General Hospital) 骨關節放射科跟 Dr. Rosenthal 見習電腦斷層定位 (CT guided) 射頻燒灼摘除術 (Radiofrequency Ablation, RFA)。Dr. Rosenthal 是世界上此種 RFA 技術的先驅，職觀察其對於骨樣瘤 (Osteoid osteoma) 及轉移惡性腫瘤 (Metastatic carcinoma) 造成的疼痛症狀性解除作治療，收穫很多。

職於同年十二月初再度參加北美放射線學會大會順利完成兩篇口頭報告，北美放射線學會大會爲全世界最大，最權威的放射線學大會，職感到非常光榮也感謝兩位老師對於職的信任與鼓勵。

職所作的"The Effect of Meniscal Tear on Cartilage Loss and

師而言是很重要的參考依據。術後的纖維修復組織或疤痕， 變形常會干擾判讀，但最近的研究報告已經逐漸找出診斷原則(包括職所作研究磁振造影在 carpal tunnel syndrome 術後復發的診斷值及應用等等)，極具發展潛力。

3.小關節磁振造影包括 Elbow 關節，手腕關節，踝足關節，Temporomandibular 關節也有很大的開發空間。一般來說這些關節結構較細膩而複雜診斷較不易，但在美國接受訓練給予職信心去接受這挑戰。

4. 需更廣泛介紹磁振造影在骨科，免疫風濕科，及復健科各領域的應用優點。儘管台灣健保制度給予臨床醫師很多限制，本院現有磁振造影檢查機器每日加班應付各科檢查已相當吃力，臨床一直給予骨關節磁振造影相當的支持。職希望有機會能繼續介紹磁振造影檢查，讓更多的醫師了解其影像的優異對診斷有很大的幫忙進而造福病人。

5. 職在美國進修期間共完成三篇文章，已經以第一作者投稿尚在修稿中 (結果請見 參考 Reference 1-3)，另一篇文章已除初步完成並獲得美國放射線醫學會(ARRS) 的接受將於 2004 年五月在邁阿密作口頭報告(結果請見 參考 Reference 4)。在研究方面初步達成一定的水平，但這是不夠的，今後須在本院研究方面繼續努力。

6. 骨骼肌肉放射線學介入性(interventional)檢查治療的繼續推展。

脊椎選擇性硬膜外注射(Selective epidural injection)是相當實用的檢查治療，運用普通 X 光透視機器 (Fluoroscopy) 定位在硬膜外注射止痛藥對於神經痛 (radicular pain) 的病人是經濟實惠的治療。運用普通電腦斷層定位 (CT guided) 射頻燒灼摘除術 (Radiofrequency Ablation) 對於骨骼肌肉腫瘤特別是骨樣瘤 (Osteoid osteoma) 的治癒及轉移惡性腫瘤 (Metastatic carcinoma) 造成的疼痛症狀性解除方面有相當好的治療效果。本部也已具有硬體條件可以去開發。

建議:

1. 積極努力提高本院的知名度，職所接觸的美國醫師都不知道榮總爲何，表示本院還有一段很長的路去走。

2. 建立擴大榮總系統建立良好的機制及溝通管道，吸收更多醫院加入本院系統。

3. 本院現有磁振造影檢查機器三台每日加班應付各科檢查已相當吃力，面對國內及世界各大醫院臨床及研究方面的快速競爭與挑戰，實有增加檢查儀器的必要，建議繼續增購磁振造影檢查儀器。

4. 加強與陽明大學基礎研究方面的合作。在紐約的 New York University (NYU) Medical System 有很廣大基礎研究人才支持臨床的研究及計畫，讓人羨慕。

5. 鼓勵臨床醫師多認識磁振造影的優點。骨關節磁振造影的應用可以全方位去思考，去開發。

參考 Reference:

參考 Reference 1:

Potential MR signs of recurrent carpal tunnel syndrome

Hung Ta, H. Wu[1] M.D., Mark E. Schweitzer[2] M.D., Randall W Culp[3] M.D.

1. Department of Radiology, Taipei Veterans General Hospital, National Yang Ming University, Taipei, Taiwan

2. Department of Radiology, New York University-Hospital for Joint Diseases, New York, NY

3. Department of Orthopedic surgery, Philadelphia Hand Center, King of Prussia, PA

Abstract:

Purpose: In nonoperated patients, the MR diagnosis of carpal tunnel syndrome (CTS)

is difficult. In the post-operative patient this difficulty is compounded. Consequently, we sought to evaluate for potential MR signs of post operative CTS.

Methods and Materials: At 1.5 T, 41 wrists in 37 patients with previous CTS release were evaluated by two observers for 1. flexor retinacular regrowth, 2. median nerve: a) high T2 signal, b) proximal enlargement , c) fibrous fixation, d) neuroma, e) laceration, f) entrapment. 3. flexor tenosynovitis. 4.mass; bursitis, accessory muscle, distal belly progression, or excessive deep fat. 5.hamate fracture, 6.volar nerve migration 7.tear of TFCC (triangular fibrocartilage complex), scapholunate (SL), or luntotriquetral ligaments (LT). Electromyography (EMG), operative findings, and clinical follow-up were used to determine the presence of recurrent CTS.

Results: 15/41 wrists had recurrent CTS. Retinacular regrowth was seen in 4/15 (27%) with and 7/26 (27%) without recurrent CTS ($p = .7$), Excessive fat was seen in 1/15 (7%) with and 2/26 (8%) without CTS ($p=.19$). No patient had incomplete resection of flexor retinaculum, scarring, neuroma of nerve, or tendon laceration; bursitis, accessory or distal muscle progression of muscle belly, or hamate fracture. Nerve edema with high T2 signal was seen in 4/15(27%) with and 3/26 (12%) without CTS($p = .16$); proximal enlargement in 6/15 (40%) with and 2/26 (8%) without CTS

(p = .007). Also 1 patient with recurrent disease demonstrated a mass and one other patient without CTS had nerve entrapment. Tenosynovitis was seen in 9/15 (60%) with and 9/26 (35%) without recurrent CTS (p=.02). Counterintuitively, the nerve was more palmar with recurrent CTS than without (mean 6.9 /8.9 mm). Of potential non-CTS causes of symptoms, SL tears were seen in 2/15 (13%) with CTS and 6/26 (23%) without CTS(p = .76).;LT tears in 1/15 (7%) with but none without CTS (p = .26); and TFCC tears in 5/15 (33%) with and 7/26 (27%) without CTS (p = .5)

Conclusion: Only proximal enlargement, tenosynovitis, and the rare mass may help to diagnose recurrent CTS by MR. However, there appears to be a subgroup of patients with recurrent neuropathy related to an excessively superficial median nerve.

Key words: MR, post operative, carpal tunnel syndrome, median nerve, wrist

參考 Reference 2:

Is epidural fat associated with body habitus ?

Hung Ta H Wu[1] M.D., Mark E Schweitzer[2] M.D., Laurence Parker[3] Ph.D.
1. Department of Radiology, Taipei Veterans General Hospital, National Yang Ming University, Taipei, Taiwan

2. New York University-Hospital for Joint Diseases, New York NY

3. Department of Radiology, Thomas Jefferson University Hospital, Philadelphia PA

Abstract:

Objective:

To evaluate, in the spine, the relationship between the amount of epidural fat to body weight, height, body mass index (BMI), presence of obesity, depth of posterior subcutaneous fat, as well as gender and age.

Materials and Methods:

At 1.5 T, 101 random patients were analyzed. In the lumbar spine, we calculated the depth of the anterior and posterior epidural fat, as well as posterior

subcutaneous fat, separately at the L3-4, L4-5, and L5-S1 levels. Obtained via questionnaire was patient's age, gender, body weight, height, with a calculated BMI (body weight/height^2, Kg /m^2). Statistical analysis was performed to assess the correlation between epidural and subcutaneous fat with age and gender, weight, height, BMI, and presence of obesity (BMI > 27.5 Kg/m^2).

Results:

There were 66 men and 45 women, age ranged 14-83 years old (mean 43). The weight range was 47.6 - 135.4 (mean 79.5 Kg); height range was 124.5-208.3 (mean 169.7cm); BMI range was 16.9 -42.8 (mean 27.8). Female gender correlated only with subcutaneous fat depth (sum, r = -0.31, p =0.002). Younger patients had more anterior epidural fat (sum, r = -0.22, p =0.024) but not posterior epidural fat (sum, r = 0.01, p =0.954) or subcutaneous fat (sum, r = 0.09, p =0.0357). Weight correlated with posterior epidural fat (sum, r = 0.21, p = 0.037) and subcutaneous fat (sum, r = 0.51, p< 0.0001). Height showed correlation negatively with posterior subcutaneous fat thickness (sum, r = -0.25, p = 0.014), but had no significant correlation with epidural fat. BMI showed a correlation with posterior subcutaneous fat (r = 0.71, p< 0.0001 for sum). Somewhat unexpectedly, BMI had no correlation with either posterior (r =0.12,

p =0.221 for sum) or anterior epidural fat (r =0.11, p =0.271 for sum), and most importantly the presence of obesity was associated only with subcutaneous fat (p < 0.0001), but not with any specific or summated epidural fat measurement (p = 0.0801-0.7692).

Conclusion:

Weight but not body habitus is associated with specific, usually posterior, patterns of epidural fat deposition. Overall obesity is unrelated to epidural fat.

Key words: MR, fat, lipoma and lipomatosis, obesity, spinal canal

參考 Reference 3:

Edematous Schmorl's Nodes on Thoracolumbar MR Imaging: Characteristic Patterns and Changes over Time

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ABSTRACT

Purpose:

To describe the patterns and note the evolution of edematous Schmorl's nodes.

Methods and Materials:

In 47 patients (M:F=26:21, 24-86 years, average 60) 84 Schmorls nodes with T2 hyperintensity with serial MR exams were evaluated. Interval between MR exams was

2-72 months (average 17). Two observers noted size, location, margins, internal and surrounding T1/T2 signal, adjacent disc herniation or bulge, concentric ring, underlyingfracture, malignancy, infection, or prior disc surgery, and serial MR changes in thesecharacteristics over time.

Results:

Node size averaged 7x9 mm. Most were located at L3 (29%, 24/84), L4 (19%,16/84) and L2 (13%,11/84), at the central (39%, 33/84) or outer (30%, 25/84) third of the endplate. 55%(39/71) had a bulging disc, 7%(5/71) had disc herniation. 10%(8/84) had evidence of associated fracture, 17%(14/84) tumor, 7%(6/84) infection. Most nodes had well-defined margins (82%, 69/84). The most common node internal signal was isointense to adjacent disc on T1/T2 (33%, 28/84); surrounding marrow was most commonly hypointense on T1 and hyperintense on T2 (54%,38/71). A common finding was concentric rings (38%, 32/84) in the marrow surrounding the node, a finding which had 72% negative predictive value for absence of infection, tumor and fracture. On follow-up, there was no interval change in node size in 46%(39/84) of Schmorl's nodes. 26%(22/84) had increased size. Most (60%, 50/84) showed no temporal change in internal T2 signal. 21% (18/84) of nodes showed decreased internal T2 signal; 13%(11/84) increased. Regarding the surrounding marrow, most (58%,49/84) showed no temporal change in T2 signal. 21%(18/84) showed decreased T2 signal, 13%(11/84) showed increased T2 signal. In 13 Schmorl's nodes with intranodal enhancement, eight (62%) showed no interval change; among eight with enhancement in surrounding marrow, five (63%) showed no change on follow-up.

Conclusion:

Although most remain unchanged, a relatively large minority of edematous Schmorls nodes evolve in size and signal over a relatively short time. Some evolve to form well-defined concentric rings in the surrounding marrow that appear to be analogous todegenerative changes of endplates. Vertebral fracture or tumor, as well as disc infection may result in Schmorl's node formation. Concentric ring formation has a high negative predictive value for "idiopathic" Schmorl's nodes without underlying fracture, infection, or malignancy.

Key words: Spine, MR; Spine, intervertebral disks; Spine, abnormality.

參考 Reference 4:

The Effect of Meniscal Tear on Cartilage Loss and Osteoarthritis of the Knee: Findings on Serial MRI Examinations

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Abstract:

Purpose:

Compartmental hyaline cartilage loss in the knee often follows meniscal tear; we sought to determine factors associated with this process using serial MRI exams.

Materials and Methods:

54 knees (52 patients, M/F=25/27, age 15-70, avg 42) with meniscal tear and multiple sequential MRI exams (avg follow-up 19 months, range 2.5-52 months) were evaluated. Two reviewers recorded meniscal tear (location, extent, type and extrusion in mm), bone marrow edema, ligament tear, osteophytes, and cartilage loss. Cartilage

loss was graded based on the most severe region involved: grade 1=signal abnormality only; 2=less than 50% partial thickness loss; 3=greater than or equal to 50% partial thickness cartilage loss; 4=full thickness cartilage loss. Sequential changes in these findings were recorded.

Results:

30 of 54 knees (56%) had progressive cartilage loss; 5 knees had both medial and lateral meniscal tears (59 total tears, 47 medial / 12 lateral). Most highly associated with cartilage loss was: meniscal extrusion (greater than 3mm: 21 of 36 menisci, 58% vs 3/23, 13%; p= 0.001), subchondral marrow edema (11 of 32 knees, 34% vs 1/22, 4%; p= 0.01), and complex tear (15 of 36 menisci, 42% vs 3/23, 13%; p= 0.02). Associated with no cartilage loss on follow-up was: oblique tear (13 of 23 menisci, 57% vs 8/36, 22%; p=0.007) and vertical longitudinal tear (6 of 23 menisci, 26% vs 2/36, 6%; p= 0.025). Extensive tear was not associated with progressive cartilage loss (2-3 segments: 13 of 36 menisci, 36% vs 5/23, 22%; p= 0.242); neither was medial meniscal tear (25 of 47 medial meniscal tears, 53% had progressive diffuse cartilage loss vs lateral meniscal tear, 5/12, 42%, p= 0.19). Rapid cartilage loss (1 year or less, seen in N=17 knees, 20 menisci) was not significantly associated with tear type, extent, location, extrusion or associated ligament tear.

Conclusions:

In knees with meniscal tear, extrusion greater than 3mm and subchondral edema is associated with subsequent cartilage loss. Complex tear more commonly exhibits progressive cartilage loss, whereas oblique and vertical longitudinal tears are associated with cartilage preservation. Extent of tear and medial vs. lateral tear is not associated with progression of cartilage loss.