

BSNR 2002

Annual Meeting of the
British Society of Neuroradiologists¹



11th—12th October 2002
Guildhall, Winchester

SCIENTIFIC PROGRAMME & BOOK OF ABSTRACTS

This book of abstracts sponsored by **Lodestone**

¹The Royal College of Radiologists has approved the scientific programme of this meeting for 11 Category 1 CPD Credits

BSNR 2002
BRITISH SOCIETY OF
NEURORADIOLOGISTS ANNUAL
MEETING

The Guildhall, Winchester
11th/12th October 2002

Thursday 10th October

16.30-18.30 Registration at the Wessex Hotel

Friday 11th October

8.30-9.00 Registration at the Guildhall in the Exhibition Hall

9.00 Introduction and Welcome
Dr Simon Barker
Wessex Neurological Centre

SCIENTIFIC PROGRAMME 1

Chair Dr Richard Bartlett, Hull

Friday

9.05 **Global Atrophy Of The Trigeminal Nerve In Trigeminal Neuralgia**
Kirsch C, Beric V, Evanson J
St. Bartholomews and the Royal London Hospitals

9.17 **Superior Oblique Myokymia: MR Support For The Neurovascular Compression Hypothesis**
Yousry I, Dieterich M, Naidich TP, Schmid UD, Yousry TA
Klinikum Grosshadern, Munich, Germany; The Mount Sinai School of Medicine, New York, USA; Klinik im Park, Zrich, Switzerland; Institute of Neurology, London, UK

9.29 **Perivascular Space Dilatation as a cause of Triventricular Hydrocephalus**
Joy HM, Ditchfield A, Barker CS
Wessex Neurological Centre, Southampton General Hospital

9.41 **Accuracy of FLAIR Imaging and the Pulvinar Sign in Variant Creutzfeldt-Jakob Disease**
Summers DM, Collie DA, Sellar RJ, Cooper S, Knight R, Will RJ, Ironside JW
Department of Clinical Neuroradiology, National CJD Surveillance Unit, Western General Hospital, Edinburgh

- 9.53 **CT Topical Dacryocystography: An underused technique in the investigation of epiphora**
Evans AL, Quaghebeur G
Radcliffe Infirmary, Oxford
- 10.05 **Collateral Ability Of The Circle Of Willis In Patients With Unilateral Internal Carotid Artery Occlusion. Border Zone Infarcts And Clinical Symptoms**
Hendrikse J, Hartkamp M, Hillen B, Mali WPTM, Van Der Grond J
University Medical Centre Utrecht, The Netherlands and
Wessex Neurological Centre, Southampton, UK
- 10.17 **Imaging In Adult Cerebral Malaria: Importance Of Imaging Findings And Correlation With Postmortem Findings**
Patankar TF, Karnad DR, Shetty PG, Desai AP, Prasad SR
King Edward Memorial Hospital ,Bombay, India
- 10.29 **Ossification of Ligamentum Flavum in Caucasian Population and its Complications**
Rajashanker B, Coutinho C
Preston Royal Infirmary, Preston
- 10.45-11.15 **MORNING COFFEE**

SCIENTIFIC PROGRAMME 2

Chair Dr Margaret Hourihan, Cardiff

Friday

- 11.15 **INVITED LECTURE**
The Highs And The Lows - Idiopathic Intracranial Hypertension And Spontaneous Intracranial Hypotension
Professor Brian Tress
The Royal Melbourne Hospital, Melbourne, Australia
- 11.45 **What Is A Normal Magnetic Resonance Venogram?**
Rao S, Higgins JNP
Addenbrooke's Hospital, Cambridge
- 11.57 **Comparison of Magnetic Resonance Venography in Patients With Benign Intracranial Hypertension and Normal Controls.**
Higgins JNP, Gillard JH, Owler BK, Harkness K, Pickard JD
Addenbrooke's Hospital, Cambridge
- 12.09 **Familial Intracranial Aneurysms, A Radiologists Dilemma**
Gunawardena W. J. , Coutinho C. M. A
Lancashire Teaching Hospitals Trust, Royal Preston Hospital

- 12.21 **Serial Evaluation Of Low-Grade Gliomas Using Registered Volumetric MRI**
Rees J H, Moore EA, Fox NC, Benton C, Jäger HR, Stevens J, Waldman AD
National Hospital for Neurology and Neurosurgery, Institute of Neurology and Charing Cross Hospital, London
- 12.33 **Cerebral White Matter lesions (WML) and Microhaemorrhages (MH): Do They Correlate With Ventricular Hypertrophy And Increased Intima-Media Thickness ?**
Jäger HR, Ojini F, Sidhu P, Miszkiel K, Holdright DR, Brown MM
Institute of Neurology, and National Hospital for Neurology and Neurosurgery Queen Square
- 12.45 **Relationship Between Cerebral White Matter Lesions On MRI And Medial Temporal Lobe Atrophy In Subjects With Early Cognitive Impairment**
Prettyman R, Lazarus R, Cherryman G
University of Leicester and University Hospitals of Leicester NHS Trust
- 13.00-14.00 **LUNCH**

SCIENTIFIC PROGRAMME 3: DIDACTIC SESSION

Chair Dr Juliet Britton, London

Friday

14.00 **Congenital Spinal Disorders**
Dr WK Chong
Great Ormond Street Hospital, London

14.30 **The Cranio-Cervical Junction**
Dr J Stevens
The National Hospital for Neurology and Neurosurgery, Queen Square, London

15.00-15.30 **AFTERNOON TEA**

SCIENTIFIC PROGRAMME 4: DIDACTIC SESSION

Chair Dr James Byrne, Oxford

Friday

15.30 **Interventional Radiology: Kyphoplasty And Vertebroplasty**
Professor D Rüfenacht
Hôpital de Radiodiagnostique, Geneva, Switzerland

16.00 **Spinal Surgery - A Surgeon's Perspective**
Mr NS Brooke
Wessex Neurological Centre, Southampton

16.30 **Interventional Radiology: Vascular Lesions Of The
Spine And Spinal Cord**
Professor D Rüfenacht
Hôpital de Radiodiagnostique, Geneva, Switzerland

17.00 end of Friday's scientific programme

17.15-18.00 **Neuroradiology SpR's Meeting**

18.30 coaches depart for evening reception

DINNER aboard HMS Warrior
dinner supported by BRACCO

Saturday 12th October

SCIENTIFIC PROGRAMME 5

Chair Dr W St Clair Forbes, Manchester

Saturday

- 9.00 **Comparative Study Of Imaging Appearances And Pathological Outcome In Paediatric Brain Stem Tumours**
Herwadkar A, Mukonowuseru W, Forbes WSTC, Hughes D, Kelsey A
Royal Manchester Childrens Hospital and Hope hospital
- 9.12 **Serial Short Echo Time Single Voxel Proton MRS For Early Detection Of Malignant Transformation In Low Grade Gliomas**
Waldman AD, MacManus DG, Moore EA, Stevens J, Rees J H
National Hospital for Neurology and Neurosurgery, Institute of Neurology and Charing Cross Hospital, London
- 9.24 **Ultrafast Imaging In Paediatric Neuroradiology**
Griffiths PD, Smith JT, Singh RK, Wilkinson ID
Section of Academic Radiology, University of Sheffield
- 9.36 **Investigating Brain Connectivity Using Finite Element Analysis of Diffusion Tensor Imaging**
Pena A, Graves MJ, Carpenter TA, Pickard JD, Gillard JH
Addenbrookes Hospital and the University of Cambridge
- 9.48 **Shear Nonsense: The Severnside Subdural Study**
Stoodley N, Kemp AM, Datta S and Renowden S
Departments of Radiology and Community Child Health, University of Wales and of Neuroradiology, Frenchay Hospital, Bristol
- 10.00 **MR Imaging Features in Neuroferritinopathy**
Coulthard A, Crompton D, Curtis AJ, Burn J
Depts Radiology and Genetics, University of Newcastle upon Tyne
- 10.12 **The Role Of MR Imaging In The Diagnosis Of Non-Traumatic Intraparenchymal Haemorrhage In Children**
Liu AC, Saunders DE, Chong WK
Department of Neuroradiology, Great Ormond Street Hospital, London

10.30-11.00 **MORNING COFFEE**

SCIENTIFIC PROGRAMME 6

Chair Dr Andrew Molyneux, Oxford

Saturday

- 11.00 **Contrast-enhanced MRA (CEMRA) In Acute Stroke**
Likeman M, Jäger HR
National Hospital for Neurology and Neurosurgery, Queen Square, London

- 11.12 **Limitations Of High-Resolution Black-Blood Cross-Sectional Magnetic Resonance Imaging In The Assessment Of Carotid Stenosis**
JM U-King-Im, MJ Graves, RA Trivedi, M Gaskarth, E Sala,
EA Warburton, PJ Kirkpatrick and JH Gillard
University department of Radiology, Addenbrooke's Hospital, Cambridge
- 11.24 **Haemorrhagic Transformation Of Acute Ischaemic Infarcts: A Pitfall In The Interpretation Of DWI Images And ADC Maps**
Jäger HR, Soh C, Beric V, Losseff N, Brown MM
Institute of Neurology and National Hospital for Neurology and Neurosurgery, Queen Square
- 11.36 **A Comparison Of CT versus Diffusion Weighted Imaging In Hyper-acute Middle Cerebral Artery Stroke Using A Systematic Quantitative Score (ASPECTS)**
Barber P A, Hill M D, Demchuk A M, Pexman JHW,
Hudon M E, Tomanek A, Frayne R R and Buchan A M
Dept. of Clinical Neurosciences, Foothills Medical Centre, Calgary, Canada
- 11.48 **Perfusion Assessment By MRI Of Pituitary Tumours At 3 Tesla**
Byrne JV, Turner HE, Jezzard P
Departments of Radiology, Endocrinology and Diabetes,
and the Centre for fMR of the Brain, Oxford
- 12.00 **JAMES BULL LECTURE**
A Critical Evaluation Of The Role Of Neuroradiology In Acute Ischaemic Stroke
Professor B Tress
The Royal Melbourne Hospital, Melbourne, Australia
- 13.00-14.00 **LUNCH**
supported by Schering Healthcare Ltd

SCIENTIFIC PROGRAMME 7

Chair Dr John Millar, Southampton

Saturday

- 14.00 **INVITED LECTURE**
The ISAT Study
Dr A Molyneux
Radcliffe Infirmary, Oxford
- 14.20 **Multislice CT Angiography Of The Entire Length Of The Carotid And Vertebral Systems**
Lamin S, Teasdale E, Sloss S
Department of Clinical Neuroradiology, Institute of Neurological Sciences, Glasgow

- 14.32 **Coiling Of Middle Cerebral Artery Aneurysms:
A Prospective Series Of 100 Cases**
Soh C, Sellar RJ, White PM
Department of Clinical Neurosciences, Edinburgh
- 14.44 **Volume-Rendered MR Angiography For The Demonstration
Of Intracranial Aneurysm Morphology**
Birchall D, Mahattanakul W, English P
Regional Neurosciences Centre, Newcastle upon Tyne
- 14.56 **Aneurysmal Subarachnoid Haemorrhage - Newcastle
Non-Randomised Study**
Keane L and Gholkar A
Regional Neurosciences Centre, Newcastle Upon Tyne
- 15.06 **The Intradural Vertebral Artery As A Source Of Subarachnoid
Haemorrhage: Are Both Vessels Imaged Adequately with
Unilateral Vertebral Catheterisation?**
Hampton TJ, Millar J
Wessex Neurological Centre, Southampton
- 15.18 **A Biomechanical Explanation For The Analgesic Effect
of Vertebroplasty?**
Annesley-Williams D, Bradley M, Renowden S, Lewis T,
Pollintine P, Farooq N, Park J, Dolan P
Frenchay Hospital Department of Anatomy, University of Bristol
- 15.30 **Close of Scientific Programme
Preview of Amsterdam 2003**
- 15.30-16.00 **AFTERNOON TEA**
- 16.00-17.00 **BSNR ANNUAL GENERAL MEETING**
(full members only)
- 19.30 for 20.00 **ANNUAL DINNER**
Presentation of the Burrows Prize for outstanding scientific paper
Dress - Black Tie
The Great Hall, Winchester
supported by Siemens Medical Systems

Global Atrophy of the Trigeminal Nerve in Trigeminal Neuralgia

Kirsch C, Berik V, Evanson J
St. Bartholomews and the Royal London Hospitals

Speaker

V. Berik

Purpose

Trigeminal neuralgia (tic douloureux) is characterized by paroxysmal facial pain confined to one or more branches of the trigeminal nerve. The aetiology is believed to be secondary to neurovascular compression; however, anatomical factors such as global atrophy of the trigeminal nerve have been reported in up to 42% of patients(1). This paper assesses the presence of neurovascular contact and the degree of atrophy within the trigeminal nerve in patients with trigeminal neuralgia.

Methods

A retrospective review of 50 cases of trigeminal neuralgia sent for MRI imaging was performed by three neuroradiologists, evaluating for the presence and type of neurovascular contact and an assessment of the degree of atrophy noted within the trigeminal nerve on the affected side using the contralateral side as a control.

Results

In approximately 90% of cases a vessel causing neurovascular conflict was found. In less than 20% of cases global atrophy of the trigeminal nerve was noted. In one case severe atrophy of the nerve with no vascular contact was noted on initial MR imaging. The patient returned for thin section MR imaging and a tiny area of vascular contact abutting the atrophic nerve was identified.

Conclusions

Although neurovascular conflict is an important factor in trigeminal neuralgia, the presence of trigeminal nerve atrophy is also an important anatomic consideration. A review of the development of the trigeminal nerve and causative aetiologies of atrophy is presented.

References

Sindou M, Howeidly T, Acevedo G, Anatomical observations during microvascular decompression for idiopathic trigeminal neuralgia. *Acta Neurochir*, 2002 Jan; 144(1):1-12

Superior Oblique Myokymia: MR Support for the Neurovascular Compression Hypothesis

Yousry I, Dieterich M, Naidich TP, Schmid UD, Yousry TA

Departments of Neuroradiology and Neurology, Klinikum Grosshadern, Ludwig-Maximilians University, Munich, Germany; Departments of Radiology and Neurosurgery, The Mount Sinai School of Medicine, New York, USA, Neurosurgical Unit, Klinik im Park, Zrich, Switzerland, Institute of Neurology, London, UK

Speaker

Prof T. A. Yousry

Purpose

Superior oblique myokymia (SOM) is a rare movement disorder thought to be caused by vascular compression of the trochlear nerve (NIV). Direct display of such neurovascular compression by magnetic resonance imaging (MRI) has been lacking. The goal of this study was to assess the presence of neurovascular contacts in patients with SOM using a specific MRI protocol.

Methods

A total of six patients suffering from right SOM underwent detailed neuro-ophthalmologic examination, which revealed a tonic or a phasic eye movement. All patients underwent MRI using a three-dimensional Fourier transform constructive interference in steady-state (3D CISS) sequence in combination with 3D time of flight MR arteriography both before and after administration of Gd-DTPA.

Results

With this protocol, NIV could be visualized on 11 of 12 sides (92%). Arterial contact was detected at the root exit zone (REZ) of the symptomatic right NIV in all six patients (100%). No arterial contact was identified at the REZ of the asymptomatic left NIV in any of the 5 left nerves visualized.

Conclusions

SOM can result from neurovascular contact at the REZ of NIV, and therefore should be considered among the neurovascular compression syndromes.

Perivascular Space Dilatation as a Cause Of Triventricular Hydrocephalus

Joy HM, Ditchfield A, Barker CS
Wessex Neurological Centre, Southampton General Hospital, Southampton

Speaker

Dr H Joy

Background

Prominent perivascular spaces (PVS) are routinely demonstrated on MRI and common locations include the subcortical white matter and inferior basal ganglia. They are also recognised within the midbrain (1). Rarely PVS may significantly enlarge such that they exert mass effect, and if located close to a ventricular outflow tract then hydrocephalus may result.

Methods

We present two cases in whom greatly enlarged PVS within the midbrain were presumed to be the cause of triventricular hydrocephalus. A limited number of similar cases were found in the literature (2,3).

Results / Discussion

The imaging appearance of these lesions will be reviewed, the differential diagnosis discussed and the pathophysiology of the PVS considered. The PVS is an interstitial fluid-filled compartment that is completely separated from the subarachnoid space by a layer of pia mater (4). The structure of the PVS within the basal ganglia and subcortical white matter differ, the penetrating artery being surrounded by two layers of leptomeninges in the former site, but only one layer in the latter site (5). These differences in structure may contribute to the greater frequency of enlarged PVS being found in the basal ganglia than the cerebrum. It is likely that the structure and potential for mass effect of PVS in the midbrain correlates with PVS found in the basal ganglia.

References

1. Elster AD, Richardson DN (1991) *AJNR* 11:1119-1122
2. Kanamalla US, Calabro F, Jinkins JR (2000) *Neuroradiology* 42:881-884
3. Mascalchi M, Salvi F, Godano U et al (1999) *J Neurosurg* 91:669-674
4. Zhang ET, Inman CB, Weller RO (1990) *J Anat* 170:111-123
5. Pollock H, Hutchings M, Weller RO, Zhang ET (1997) *J Anat* 191:337-346

Accuracy of FLAIR Imaging And the Pulvinar Sign in Variant Creutzfeldt-Jakob Disease

Summers DM, Collie DA, Sellar RJ, Cooper S, Knight R, Will RJ, Ironside JW
Dept. Clin. Neuroradiology, Nat. CJD Surveillance Unit, Edinburgh

Speaker

Dr D Summers

Purpose

We have previously described the pulvinar sign on MRI as the presence of posterior thalamic high signal on long TR sequences in variant CJD(1). We subsequently analysed a larger cohort of cases of vCJD to determine the incidence and accuracy of this sign on different MRI sequences.

Methods

MR imaging for all patients referred with suspected CJD to the National CJD Surveillance Unit over a five year period was analysed prospectively by one observer for the presence of the pulvinar sign. The MR imaging of the 92 neuropathologically confirmed cases of vCJD identified to date were then analysed. 2 observers independently graded the presence or absence of the pulvinar sign on each available sequence using a previously validated semi-quantitative scale. Imaging was then reviewed jointly to reach a consensus.

Results

110 examinations in 86 patients were available for review. 78/86 (90.7%) patients had scans which were positive for the pulvinar sign on one or more sequences. 8 patients had negative scans. 47/58 (81%) of PD-weighted sequences, 77/108 (71.3%) of T2-weighted sequences, and 30/30 (100%) FLAIR sequences demonstrated pulvinar hyperintensity at consensus review. Interobserver agreement was good for PD weighted imaging ($K=0.64$) and T2 weighted imaging ($K=0.73$), and there was perfect concordance ($K=1.0$) for FLAIR. None of the prospectively analysed examinations in other patients who subsequently had a diagnosis other than vCJD had a positive pulvinar sign.

Conclusions

FLAIR imaging, preferably in the axial plane, is currently the imaging sequence of choice for the identification of pulvinar hyperintensity, with high sensitivity and specificity. Interpretation of the pulvinar sign on other sequences alone should be made with some caution. To avoid any ambiguity the pulvinar sign should be restated as bilateral symmetrical hyperintensity of the pulvinar nucleus of the thalamus, relative to the anterior half of the putamen.

(1) Zeidler M, Sellar RJ, Collie DA, et al. Lancet 2000; 355:1412-1418.

CT Topical Dacryocystography: an Underused Technique in the Investigation of Epiphora

Evans AL, Quaghebeur G
Radcliffe Infirmary, Oxford

Speaker

Dr AL Evans

Purpose

To explore the use of CT Topical Dacryocystography in the investigation of epiphora as an alternative to combined Conventional Dacryocystography and Dacryoscintigraphy.

Methods

2-3 drops of Omnipaque 300 dropped onto each eye every 2-3 minutes for 15 minutes. Helical CT scan at high resolution through the nasolacrimal system. Workstation review of images.

Results

The examination was well tolerated. Good quality images were obtained for the nasolacrimal system using the physiological lacrimal pumping mechanism without the need for cannulation.

Conclusions

In addition to greater anatomical detail in the nasolacrimal system than obtained with a conventional dacryocystogram the investigation provides functional information about lacrimal drainage obviating the need for an additional dacryoscintigram. From a patients perspective there is no need for topical local anaesthetic. In addition the investigation is cost effective and can be performed on a routine CT list without additional angiographic suite/nurse/radiologist time.

Collateral Ability of the Circle of Willis in Patients With Unilateral Internal Carotid Artery Occlusion. Border Zone Infarcts And Clinical Symptoms

Hendrikse J, Hartkamp M, Hillen B, Mali WPTM, Van Der Grond J
University Medical Centre Utrecht, The Netherlands

Speaker

Dr M Hartkamp

Purpose

The purpose of this study was to establish whether the collateral ability of the circle of Willis is related to the presence of border zone infarcts in symptomatic patients with TIA or minor stroke and asymptomatic patients with unilateral occlusion of the internal carotid artery (ICA).

Methods

Thirty-five symptomatic and sixteen asymptomatic patients (in total 51 patients) with unilateral occlusion of the ICA and insignificant contralateral ICA stenosis (less than 70%) were investigated and compared with 53 control subjects. Flow direction on the ipsilateral side (ICA occlusion side), as well as size of the component vessels in the circle of Willis were investigated with (quantitative) three-dimensional time-of-flight MRA and (qualitative) two-dimensional phase contrast MRA sensitive to flow direction.

Results

The presence of collateral flow through the circle of Willis was significantly higher in the group of patients without border zone infarcts than those with border zone infarcts: 92% versus 60%, $P < 0.05$, and this was mainly due to the higher prevalence of collateral flow via the posterior communicating artery in patients without border zone infarcts (50% versus 12%, $P < 0.05$). Asymptomatic patients with ICA occlusion demonstrated a significantly larger anterior communicating artery diameter than symptomatic patients ($P < 0.05$), although the presence of collateral flow through the circle was not found to be related to the presence of symptoms.

Conclusions

Posterior communicating artery collateral flow is associated with a low prevalence of border zone infarcts in patients with unilateral ICA occlusion. Although no significantly increased collateral function of the circle of Willis is demonstrated in asymptomatic patients, asymptomatic patients do have a significantly larger anterior communicating artery diameter ($P < 0.05$).

Imaging in Adult Cerebral Malaria: Importance of Imaging Findings And Correlation With Post-mortem Findings

Tufail F. Patankar., Dilip R. Karnad., Prashant G. Shetty.,Anand P. Desai, Srinivasa R. Prasad,
King Edward Memorial Hospital ,Bombay, India

Speaker

Dr TF Patankar

Purpose

To correlate imaging abnormalities, clinical features and post-mortem findings in patients with proven cerebral malaria.

Methods

Twenty-one patients aged 17-50 years with cerebral malaria underwent transverse non-enhanced and contrast-enhanced CT on admission (n = 21) and on day 10 (n = 6) with 5mm sections in area of abnormality. All CT scans were evaluated to look for diffuse cerebral edema, focal parenchyma abnormalities and hemorrhage. CT findings were categorised as normal, diffuse cerebral edema, and edema with thalamic hypoattenuation without or with cerebellar hypoattenuation. Spearman's ranked correlation test was performed.

Results

In 7 patients with mild disease (APACHE II score 7, median GCS=10) initial scans were normal and all survived. Of 8 patients with diffuse cerebral edema (GCS > 8, median APACHE II 21), six survived. Cerebral edema with thalamic and cerebellar white matter hypoattenuation was seen in 5 patients. All had GCS ≤ 6, median APACHE II score 26 and multi-organ failure; none survived. One patient (GCS=6) who had thalamic hypoattenuation without cerebellar lesions survived with mild residual hemiparesis. All seven patients who died had diffuse petechial hemorrhages at autopsy, not visible on CT. CT findings did not correlate with degree of parasitemia.

Conclusions

CT findings correlate well with level of consciousness and severity of disease but underestimate the extent of disease at pathologic examination. A normal CT scan indicates a favorable outcome. Cerebellar hypoattenuation portends a poor outcome.

1. AJNR 1998; 19(5): 871-874.
2. Natl Med J India 2000; 13:86-93.
3. Oxford Textbook of medicine. 3rd ed. Oxford. Oxford university press, 1996; 835-8635.
4. Arch Dis Child 1994; 70(4): 281-287.
5. Lancet 1983; 1:434-437.

Ossification of Ligamentum Flavum in Caucasian Population And Its Complications

Rajashanker B, Coutinho C
Preston Royal Infirmary, Preston

Speaker

Dr B Rajashanker

Purpose

To analyse the prevalence of ossification of ligamentum flavum and its complications in caucasian population

Methods

A retrospective search for the diagnosis of ligamentum flavum ossification was made over a period of eight years. Ligamentum flavum ossification is uncommon in the caucasians and was considered to be a disease prevalent in the orient population. However with increased used of CT and MRI scanning more cases have been reported in the europeans. Encountering two cases over a short term period, we analysed the prevalence of this entity in caucasian population.

Results

A total of nine cases were diagnosed in the past eight years. The images were reviewed with a neuroradiologist. This study is one of the largest to present this condition in the caucasian population. At least three patients had symptoms of cord compression and most of them were symptomatic. Two of them underwent surgery with long term relief of symptoms. We discuss the etiology, Plain film, CT and MR features of this condition with good examples.

Conclusions

Ligamentum Flavum Ossification may not be as uncommon in caucasian population as previously thought to be. With increased imaging facilities and more awareness, more cases could be diagnosed in the caucasian population.

What Is a Normal Magnetic Resonance Venogram?

Rao S, Higgins JNP
Addenbrooke's Hospital, Cambridge

Speaker

Dr S Rao

Purpose

As with any radiological investigation, accurate interpretation of MRV demands an understanding of normal appearances and normal variants, usually developed in individual practitioners by exposure to large numbers of normal and abnormal studies. Central to this process are the standards, either clinical or alternative investigations, against which the significance of a particular appearance is judged. This is pertinent in MRV, especially with respect to the lateral sinuses where a wide variation in normal anatomy makes diagnosis of sinus disease difficult. Ayanzen et al (2000) performed MRV in 100 patients with normal MRI and found defects in 31% which they cautioned against diagnosing as sinus disease, mirroring the impressions of practising radiologists. The purpose of this study was to test if this was good advice.

Methods

We looked at the medical complaints of 100 consecutive patients with normal MRI.

Results

31% complained of headache, 22% of focal neurological symptoms, 11% of ataxia, 7% of acute fits.

Conclusions

Ameri and Bousser (1992) describing the clinical features of 110 patients with cerebral venous thrombosis found headache in 75%, motor or sensory deficit in 34%, seizures in 37%, ataxia in 3%. We suggest that a normal MRI, by itself, does not qualify a patient for use as a normal control in respect of MRV and that the defects seen on MRV in these cases could equally well represent disease and be responsible for symptoms.

References

1. Ayanzen RH, Bird CR, Keller PJ, et al AJNR 2000, 21: 74-78
2. Ameri A, Bousser MG. Neurologic Clinics 1992, 10:87-111

Comparison of Magnetic Resonance Venography in Patients With Benign Intracranial Hypertension and Normal Controls.

Higgins JNP, Gillard JH, Owler BK, Harkness K, Pickard JD
Addenbrooke's Hospital, Cambridge

Speaker

Dr JNP Higgins

Purpose

Before diagnosing benign intracranial hypertension (BIH) cerebral venous sinus thrombosis or cranial venous outflow obstruction must be excluded, now usually with magnetic resonance imaging and magnetic resonance venography (MRV). Acute thrombosis or its sequelae are not difficult to diagnose, especially with respect to the sagittal sinus but the wide variation in the appearances of the lateral sinuses on MRV can make interpretation difficult. The aim of this study was to establish whether there are characteristic appearances on phase contrast MRV in patients with BIH.

Methods

40 asymptomatic volunteers were recruited by advertisement to compare with 20 patients diagnosed with BIH who had had MRV as part of their normal work up.

Results

Provisional analysis indicates that bilateral lateral sinus defects were common in patients with BIH (about 80%) and rare in normal controls (up to about 5%).

Conclusions

This raises the question of whether unrecognised venous outflow obstruction is a frequent cause of BIH.

Familial Intracranial Aneurysms, a Radiologists Dilemma

Gunawardena WJ, Coutinho CMA
Lancashire Teaching Hospitals Trust, Royal Preston Hospital

Speaker

Dr WJ Gunawardena

Purpose

To establish guidelines for aneurysm screening of the relatives of index patient with subarachnoid haemorrhage (SAH) and patients and relatives with genetic and/or hereditary causes of intracranial aneurysm formation

Methods

Family history was obtained from all the patients admitted to our institution with SAH. First-degree relatives of the index patient were screened with 3D time of flight (TOF) MR angiography (MRA) if two or more of them had a history of SAH. Patients with a genetic predisposition for aneurysms such as polycystic kidney disease with a family history of SAH or cysts in both kidney and liver were screened the same way.

Results

Higher incidence of intracranial aneurysms was seen in the presence of two or more first-degree relatives with intracranial aneurysms. In polycystic kidney disease patients, higher risk of aneurysms was seen in the presence of a family history of aneurysms or if liver cysts were also seen. Aneurysm screens from non-neuroradiological institutions were inadequate, as the posterior circulation was not fully visualized.

Conclusions

3D TOF MRA as a non-invasive technique was extremely useful for aneurysm screening. We suggest that first degree relatives of the index patients be screened if one other first-degree relative has had SAH. If negative, screening should be repeated every five years until the age of 65. The twin of an index patient should be screened every two years during the decade of the haemorrhage.

References

Ronakainen A et al, (1998) *Stroke*, 29:359-362
Schievink WI (1998) *Neurosurgery Clinics of North America*, 9.3:485-496.

Serial Evaluation of Low-Grade Gliomas Using Registered Volumetric MRI

Rees J H, Moore EA, Fox NC, Benton C, Jäger HR, Stevens J, Waldman AD
National Hospital for Neurology and Neurosurgery, Institute of Neurology and
Charing Cross Hospital, London

Speaker

Dr AD Waldman

Purpose

Low-grade gliomas (LGG) commonly affect young people; they tend to transform into malignant gliomas, although this is an unpredictable event. Detection of early malignant transformation with routine MRI is limited; changes in tumour volume and signal characteristics may be subtle and contrast enhancement is variable. Registration techniques allow quantitative comparison of serial high resolution volumetric images with normalised intensities. We present initial findings of registered volumetric analysis from a series of patients with LGG examined at 6-monthly intervals as part of a multimodal longitudinal MR study.

Methods

20 patients are included; 10 patients had 2 examinations and 10 patients had 3 examinations. All patients were scanned using a range of imaging sequences on a 1.5 T system (LX, GE Medical Systems). Coronal 3D IR-prepped SPGR data were registered and analysed offline using MIDAS (Medical Information Display and Analysis System).

Results

11 patients had stable disease and no volumetric changes. 4 patients had definite or probable clinical progression, and all showed clear changes in the pre-contrast volumetric analysis. 5 patients had stable disease, but possible or definite changes on volumetric analysis; increased mass effect (4/5 patients), signal changes within the lesion (2/5 patients) and tumour volume increase (2/5 patients). One patient had marked progression, but showed striking response to treatment with chemotherapy.

Conclusions

Registration of serial volumetric MRI scans is much more sensitive to changes in low-grade gliomas than conventional visual inspection by a radiologist. Further study will clarify if these small changes are clinically insignificant, or are harbingers of accelerated tumour progression.

Cerebral White Matter Lesions (WML) And Microhaemorrhages (MH) : Do They Correlate With Left Ventricular Hypertrophy And Increased Intima-Media Thickness ?

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Speaker

Dr HR Jäger

Purpose

Opinions diverge on the pathogenic role of arterial hypertension and general arteriosclerosis in cerebral WML and MH. Left ventricular hypertrophy (LVH) is a reliable indicator of sustained hypertension and measurement of the intima-media thickness (IMT) of the carotid arteries is an indicator of arteriosclerotic disease. We conducted a prospective study to assess the associations between LVH, IMT, WML and MH.

Methods

68 patients (mean age 60 years) were consecutively recruited from a multidisciplinary stroke clinic. All had echocardiography with calculation of the left ventricular mass index, carotid Doppler with measurements of IMT and MRI (T2 FSE, T2*w GRE, DWI and FLAIR sequences). Scoring of WML and counting of MH on the MRI was performed blinded to other results. A detailed scoring system of the Task Force for Age-Related White Matter Lesions was used.

Results

54% of patients had WML and 15% had MH. Significant associations were found between all types of WML and age ($p < 0.01$), as well as advanced confluent WML and increased IMT ($p < 0.01$). No significant relationships were found between LVH and WML. Presence of MH did not correlate with age or IMT. 8 of 10 patients with MH had LVH but this did not reach statistical significance.

Conclusions

Age was the most important factor for the presence WML and hypertension, defined by LVH, was not significant. Arteriosclerosis, defined by IMT, only played a role in advanced WML. Larger numbers are needed to clarify the relationship between hypertension and MH.

Relationship Between Cerebral White Matter Lesions on MRI And Medial Temporal Lobe Atrophy in Subjects With Early Cognitive Impairment

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Speaker

Professor G Cherryman

Purpose

White matter lesions (WML) are a common finding in older people. The exact relationship between Alzheimers disease (AD) and cerebrovascular disease is unclear. To investigate the relationship between medial temporal lobe atrophy (MTLA) and WMLs in a well-characterised clinical population.

Methods

All patients attending a Memory Clinic between April 1998 and March 2001 were referred for MRI. This included T2 and 3D T1 weighted acquisition (MPRAGE) sequences. Deep- and periventricular WMLs were graded separately using a 5-point standardised semi-quantitative rating system. Ventricular size and sulcal width was rated on 10-point scales. MTLA was considered significant in the presence of a choroid fissure width in excess of 3mm and/or dilatation of either temporal horn in excess of 5mm at the level of the body of the hippocampus.

Results

Data was available for 91 men and 69 women with mean age 70.0 years and mean MMSE score 23.1. Subjects without MTLA (94) had significantly higher MMSE scores (mean score 24.6 vs. 21.2; $p < 0.001$); were significantly younger (mean age 66.7 vs. 74.4 years; $p < 0.001$) and had significantly lower periventricular WML score (median score 1 vs. 2; $p=0.006$). The two groups showed no significant difference in deep WML score (median score 1 vs. 1; $p=0.216$).

Conclusions

WML and evidence of MTLA are common in this population. The significant association between MTLA and periventricular WMLs but not deep WMLs would be consistent with the former have some shared pathological process with AD that may not exist for the latter.

Comparative Study of Imaging Appearances And Pathological Outcome in Paediatric Brain Stem Tumours

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Speaker

Dr A Herwadkar

Purpose

We retrospectively analyzed the MR features of paediatric brainstem tumours to correlate with histological diagnoses and assess the reliability of radiological criteria in determining the type and grade of tumour

Methods

21 patients (6m-15y) with known histological diagnoses of a brain stem tumour were selected. Scanning was performed on a 1.0T system using T1, Dual echo, FLAIR and post contrast. 2 observers analyzed the images independently blinded to the histological diagnosis. They assessed anatomical site and extent; exophytic component; signal characteristics; contrast enhancement and heterogeneity and hydrocephalus.

Results

There were 8 high grade anaplastic astrocytomas, 4 grade 2 fibrillary astrocytomas, 7 low grade pilocytic astrocytomas, 1 GBM and 1 PNET. All 12 moderate to high grade tumours centred on the pons. 7 were infiltrative and 5 focal. Dorsal exophytic component was noted in 4 cases. Only the exophytic component showed mild enhancement. Hydrocephalus was typically absent. 4/7 low grade pilocytic tumours, centred on midbrain, 2/7 at the cervico medullary junction and 1/7 at the pons. Of these 5 had exophytic components, 6 enhanced, 6 had hydrocephalus and 4 had a cystic component. The PNET involved pons, middle cerebellar peduncle and fourth ventricle with enhancement and hydrocephalus. The GBM involved pons and showed moderate enhancement.

Conclusions

The commonest tumour was the diffusely infiltrating non enhancing high grade glioma with its epicentre at pons not causing hydrocephalus. Some high grade tumours showed a focal dorsal enhancing exophytic component. The majority of tumours with epicentre in midbrain were low grade pilocytic astrocytomas with moderate enhancement, a cystic component and complicated with obstructive hydrocephalus. Cervico medullary tumours produced exophytic cystic masses which showed moderate enhancement and were low grade tumours.

Serial Short Echo Time Single Voxel Proton MRS for Early Detection of Malignant Transformation in Low Grade Gliomas

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Speaker

Dr AD Waldman

Purpose

Conventional structural imaging techniques are insensitive at detecting early changes of malignant transformation in low-grade gliomas (LGG). Non-invasive detection of this process is important as it may allow effective therapeutic intervention. We have used MRS to examine biochemical stability in low grade gliomas and metabolic changes associated with early malignant transformation.

Methods

Conventional structural imaging techniques are insensitive at detecting early changes of malignant transformation in low-grade gliomas (LGG). Non-invasive detection of this process is important as it may allow effective therapeutic intervention. We have used MRS to examine biochemical stability in low grade gliomas and metabolic changes associated with early malignant transformation.

Results

22 patients remained clinically stable; 6 showed progression (3 on imaging alone, and 3 with imaging changes and clinical deterioration). There were no statistical differences between the stable and progressive groups of patients with respect to metabolite ratios or concentrations at initial examination. Four progressive patients had more than one spectrum which showed marked, progressive increase in [Cho], or stable [Cho] and Cho/Cr but unequivocal mobile lipid resonances on the third study. One patient showed a rise which coincided with disease progression, and a return to baseline level after chemotherapy treatment.

Conclusions

SV-MRS is feasible for quantitative longitudinal studies of low-grade gliomas, despite problems of restricted sampling inherent in the single voxel technique. All patients who progressed showed either increasing choline or the appearance of mobile lipid signal. Short TE is important for lipid detection.

Ultrafast Imaging in Paediatric Neuroradiology

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Speaker

Dr JT Smith

Purpose

To compare the diagnostic information obtained from ultrafast magnetic resonance imaging with standard magnetic resonance imaging techniques in paediatric neuroradiology. The goal was to judge whether ultrafast methods can be used to replace standard methods and reduce the need for sedation or general anaesthesia as a result of the considerably shorter scan times.

Methods

This was a prospective study over a 24 month period from January 98 to December 2000, and involved 125 patients. Routine clinical imaging was performed along with two ultrafast methods. SSFSE (Single Shot Fast Spin Echo) was used to give T2 weighted images and an EPI sequence to provide a T1 weighted images. The ultrafast images were presented to an experienced neuroradiologist who was also given the information present on the initial referral card. These reports based on the ultrafast images were then compared with the formal radiological report made solely on the basis of the standard imaging.

Results

This was a prospective study over a 24 month period from January 98 to December 2000, and involved 125 patients. Routine clinical imaging was performed along with two ultrafast methods. SSFSE was used to give T2 weighted images and an EPI sequence to provide a T1 weighted images. The ultrafast images were presented to an experienced neuroradiologist who was also given the information present on the initial referral card. These reports based on the ultrafast images were then compared with the formal radiological report made solely on the basis of the standard imaging.

Conclusions

This paper demonstrates that ultrafast MR imaging can diagnose many paediatric intracranial abnormalities as well as standard methods. Anatomical resolution limits its capacity to define subtle developmental anomalies and contrast resolution limitations of the ultrafast methods reduce the detection of pathology characterised by subtle T2 prolongation. These findings start to explore the possibility of replacing long MR scan procedures which often require sedation or general anaesthesia. It appears that the ultrafast contain sufficient information to make diagnoses in many cases and we discuss clinical situations that warrant further investigation.

Investigating Brain Connectivity Using Finite Element Analysis of Diffusion Tensor Imaging

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Speaker

Dr A Pena

Purpose

It has been proposed that brain connectivity can be inferred non-invasively based on information from magnetic resonance diffusion tensor imaging (MR DTI). Based on the assumption that the main direction of diffusion is associated with the direction of white matter tracts at the voxel level, a series of tractography techniques have been presented in the literature. In this study we investigate the use of the finite element method in solving the diffusion equation to evaluate its potential in a clinical practice.

Methods

In order to determine the direction of flow and its associated fibre connectivity, the diffusion equation was solved taking into account the voxel-level diffusion properties (i.e. diffusion tensor) as measured using MR DTI. A source (or seed) was manually selected from a brain region from which diffusion originates, and then surfaces of equal concentration (iso-surfaces) computed as a function of time. These surfaces are then interpreted as regions of equal probability of diffusion. The finite element method was used to compute the solution using the program ABAQUS/Standard. Colour-coded maps and animations of the scalar and vector fields involved were produced. Three regions of interest (ROIs) were investigated: the internal capsule, genu and splenium of the corpus callosum, and the optic radiation.

Results

The structures investigated, three-dimensional iso-surfaces describing the evolution of diffusion could be identified based on a priori anatomical knowledge. On each, plots of the concentration of diffusion decreased exponentially from the infusion point, but its extent followed the main directions of diffusion. The animations clearly show the evolution of diffusion determined preferentially by the white matter tracts. For example, the seed selected at the level of the internal capsule produced surfaces travelling down towards the cerebral peduncles and up through the corona radiata and into the cortex.

Conclusions

Realistic anatomical white matter tracts can be produced using finite element methodology. MR DTI can be used to investigate connectivity between different brain regions and its changes due to various pathological conditions.

Shear Nonsense: the Severnside Subdural Study

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Speaker

Dr N Stoodley

Purpose

To review the neuroradiological aspects of abusive head trauma in infants and the association between apnoea, hypoxic-ischaemic injury and outcome.

Methods

Retrospective review of 90 children less than 2 years admitted to hospitals in South Wales and South West England between 1992 - 1998 with subdural haemorrhage or other subdural collection. Cases of non-accidental head injury (NAHI) were identified. Neuroimaging where available was reviewed by two neuroradiologists blinded to the initial report and outcome of the case.

Results

Apnoea study (n=65) The severity of admission symptoms correlate with poor outcome. Apnoea is associated with death or severe disability. Apnoeic infants are more likely to have cerebral swelling or hypoxic-ischaemic injury than those without apnoea. There is a very significant association between diffuse brain swelling and poor outcome.

Neuroradiology study (n = 74) Most NAHI cases (n=49) were below 6 months of age. 90% of initial investigations were performed in a DGH; in 7/49 the initial CT was misinterpreted. In 25 cases MRI added further information. Convexity subdurals are the commonest site in NAHI but interhemispheric and posterior fossa subdurals are more specific. Radiological diffuse axonal injury is rare and was seen in only one case. Generalised brain swelling in association with subdural haemorrhage was only seen in NAHI cases, as were subdurals of different ages.

Conclusions

Apnoea and diffuse brain swelling due to NAHI are associated with poor outcomes. DAI is rare and hypoxic-ischaemic damage is likely to be of greater prognostic significance. Neuroimaging features are suggestive of NAHI and imaging guidelines are suggested.

MR Imaging Features in Neuroferritinopathy

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Speaker

Dr A Coulthard

Purpose

Neuroferritinopathy is a recently described autosomal dominant neurodegenerative disorder arising from a mutation in the gene coding for ferritin light chain. Affected individuals accumulate brain iron and present with involuntary movements progressing to extrapyramidal symptoms. Only 28 cases of neuroferritinopathy have been identified to date and MRI findings in a few individual severely affected cases have been described. This study revisits the cranial MRI findings in a large group of patients with proven neuroferritinopathy.

Methods

The imaging status of all patients identified as having the FTL gene mutation was documented and MRI examinations collated. Images were reviewed for evidence of iron deposition and structural abnormality on proton density, T1 and T2 weighted and T2* images.

Results

16 MRI examinations from 15 patients were assessed. All examinations were abnormal, with a spectrum of appearances ranging from evidence of iron deposition on T2* images in relatively asymptomatic patients with normal spin echo imaging to gross cystic degeneration of the corpus striatum and caudate lobes in severely affected individuals. Involvement of the brain stem and dentate nuclei was variable.

Conclusions

MRI is useful in documenting brain abnormality in neuroferritinopathy. further study will attempt to correlate imaging findings with clinical status in an attempt to understand the normal progression of this disorder.

The Role of MR Imaging in the Diagnosis of Non-Traumatic Intraparenchymal Haemorrhage in Children

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Speaker

Dr AC Liu

Purpose

Structural lesions are the greatest risk factor in children with non-traumatic intraparenchymal haemorrhage (IPH). Until recently, the identification of the underlying vascular cause has relied heavily on conventional angiography (CA) performed under general anaesthesia, both of which having their own inherent risks attached. The aim of this study was to evaluate the role of MRI and MRA in the identification of both vascular and non-vascular structural lesions in children with non-traumatic IPH.

Methods

Children presenting acutely with non-traumatic IPH at Great Ormond Street Hospital between June 2000 and July 2002 were reviewed retrospectively. Radiographic studies, including CT, MR imaging, 3D TOF MRA and CA were reviewed.

Results

20 children (mean age 8.6 years; age range 12 days to 15 years 10 months) are included in the study. Structural lesions were found in 14 children (10 vascular and 4 tumour). A structural lesion was demonstrated in 10 children on the basis of MRI alone. The addition of the 3D TOF was diagnostic in 2 further patients. MRA was of added value in a further patient, who already had a diagnosis on MRI.

Conclusions

MRI and MRA are diagnostic in the majority of children presenting with non-traumatic IPH. 3D TOF MRA performed prior to T1 changes arising from blood products may demonstrate vascular lesions in sufficient detail to preclude angiography. Conventional angiography can be reserved for (1) those without a demonstrable cause on MR imaging, or (2) delayed until the time of treatment in those with vascular lesions suitable for intervention.

Contrast-Enhanced MRA (CEMRA) in Acute Stroke

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Speaker

Dr M Likeman

Purpose

Assessment of the intra and extracranial carotid and vertebral circulation with time of flight MR angiography is time consuming and requires patient cooperation, difficult in acute stroke. The purpose of this study is to assess the technical feasibility and diagnostic yield of rapid large field of view (FOV) contrast-enhanced MRA (CEMRA) in acute stroke.

Methods

15 patients with acute ischaemic stroke (10 anterior and 5 posterior circulation) were investigated with CEMRA using a large FOV covering the aortic arch (level 1), the neck vessels (level 2) and the circle of Willis (COW, level 3). Acquisition time was 50 seconds. Separate Maximum intensity projections (MIP) were produced for the right and left sided neck vessels and for the intracranial circulation. Quality was rated as non-diagnostic (ND), diagnostic at one, two or all three levels (D1, D2, D3) or excellent (E) throughout. All three levels were assessed for the presence of vascular stenoses and occlusions.

Results

The results for quality were E in 5, D3 in 3, D2 in 4, D1 in 2, ND in 1 patients. There was no motion artefact. Causes of suboptimal quality were Bolus timing errors in 4 (most frequently affecting level 1) and incomplete coverage in 2 patients. Significant stenoses or occlusions were found at level 1 in 1, level 2 in 2 and level 3 in 4 patients

Conclusions

CEMRA is a useful technique in acute stroke with good coverage and freedom from motion artefact. It allows rapid and comprehensive assessment of pathology from the aortic arch to the COW.

Limitations of High-Resolution Black-Blood Cross-Sectional Magnetic Resonance Imaging in the Assessment of Carotid Stenosis

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Speaker

Mr JM U-King-Im

Purpose

We assessed the accuracy of high-resolution black-blood magnetic resonance imaging (BB MRI) in measuring the severity of carotid stenosis.

Methods

We prospectively studied 54 symptomatic patients (74 abnormal arteries), comparing BB MRI with digital subtraction angiography (DSA). The axial MR slices were analysed with Mass Analysis Plus V 4.0.1 software. Degree of stenosis was then calculated from direct measurements of luminal diameter (NASCET criteria) by three blinded readers.

Results

Overall correlation was good (Spearman coefficient = 0.821). BB MRI performed well in detecting stenoses of more than 50% or 60%. However, for moderate (50-69%) and severe (70%) stenosis the technique was much less accurate. Unexpectedly, BB MRI tended to underestimate stenosis severity (mean difference = 7%). Inter-observer agreement was moderate (Kappa= 0.67). BB MRI identified all 15 cases of plaque ulceration apparent on DSA and 13 further cases.

Severity of stenosis	Sensitivity	specificity	NPV	PPV	p value
≥ 50%	82%	100%	100%	67%	<0.0001
≥ 60%	81%	97%	78%	97%	<0.0001
50 - 69%	64%	83%	84%	64%	=0.002
≥ 70%	60%	98%	94%	75%	<0.0001
occlusion	100%	100%	100%	100%	<0.0001

Table 1: PPV=positive predictive value, NPV=negative predictive value, p values calculated with Fisher's exact test

Conclusions

Cross-sectional imaging with BB MRI is a potentially useful screening tool and provides information about both luminal narrowing and plaque morphology. However, in its present form, it is unable to reliably distinguish between moderate and severe stenosis. Technological improvements, such as reducing flow artefacts, may help improve this technique.

Haemorrhagic Transformation of Acute Ischaemic Infarcts: a Pitfall in the Interpretation of DWI Images And ADC Maps

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Speaker

Dr HR Jäger

Purpose

To assess the influence of haemorrhagic transformation (HT) on the interpretation of diffusion weighted images (DWI) and apparent diffusion coefficient maps (ADC).

Methods

95 patients of a Stroke Unit had MRI between 0 and 7 days (median 3). 10 of these showed HT, defined by absence of haemorrhage on the admission CT and very low signal on subsequent T2*-weighted gradient echo (T2*GRE). Signal intensities of the HT and surrounding areas were assessed on T2-weighted fast spin echo (T2FSE), T2*GRE, DWI and ADC images, using a four point scale: 1, hypointense to white matter (WM); 2, isointense to WM; 3, isointense to grey matter (GM) and 4, hyperintense to GM. Regional ADC measurements were performed and expressed as ratios of normal WM.

Results

Areas of HT had the following mean visual scores: 3 (range 2-4) on T2FSE, 1 on T2*GRE, 1.8 (range 1-4) on DWI, and 1.6 (range 1-3) on ADC. Non-haemorrhagic infarcted areas had a uniform score of 4 on T2FSE, T2*GRE and DWI. Appearances on ADC maps were more complex and HT was surrounded by a zone of increased ADC (high signal) of variable thickness. Average ADC measurements were 66% of normal WM for HT, 153% for the surrounding rim and 61% for the remainder of the infarct.

Conclusions

HT can have signal intensities close to WM or GM on DWI and ADC images and lead to underestimation of infarct size. A high signal rim around HT on ADC maps (possibly clot retraction or vasogenic oedema) adds complexity and lends itself to misinterpretation. DWI and ADC images should be viewed in conjunction with T2*GRE images.

A Comparison of CT Versus Diffusion Weighted Imaging in Hyper-Acute Middle Cerebral Artery Stroke Using a Systematic Quantitative Score (ASPECTS)

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Speaker

Prof. J H W Pexman

Purpose

Tissue plasminogen activator (TPA) given within three hours of symptom onset for acute ischaemic stroke improves outcome (1). We hypothesised that CT is as good as DWI for detecting ischaemic change in hyperacute stroke when reviewed by experienced observers.

Methods

80 patients (65% male; mean age 68.4+13.2) had CT at 136min. (mean) and DWI at 240 min (mean). Five mm. thick non-contrast CT scans were performed at 80/40HU. MRI at 3T included DWI (single shot EPI TR=7000, TE=99, b=1000, 5 mm slices/ 3mm gap). A quantitative scoring system (ASPECTS)(2) was applied to CT and DWI by 5 observers independently with only knowledge of the stroke side. The reliability of each modality was assessed for each observer with intraclass correlation coefficients. Bland Altman plots were used to measure the agreement between CT and DWI.

Results

CT ASPECTS predicted DWI ASPECTS (linear regression $P < 0.001$). The difference of means between DWI and CT was - 0.3 ASPECTS, allowing for the mean difference in time for the scans. The median CT and DWI ASPECTS values were both 8. Intraclass correlation coefficients confirmed excellent reliability between observers for CT (0.81 [95% CI 0.76-0.86]) and DWI (0.78 [95% CI 0.72-0.84]).

Conclusions

CT appears comparable to DWI for assessing patients with hyperacute stroke when viewed by experienced observers using ASPECTS.

1. National Institute of Neurological Disorders and Stroke rt-PA Stroke Study Group. 1995;N Engl J Med 333:1581-87.
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Perfusion Assessment by MRI of Pituitary Tumours At 3Tesla

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Speaker

Dr J Byrne

Purpose

To assess the role of the hypophyseal portal system (HPS) in the blood supply of pituitary tumours. The pituitary anterior lobe receives the majority of its blood supply from the HPS and since most tumours arise from the anterior lobe, they theoretically are supplied by the superior hypophyseal artery/HPS. However, post-mortem examinations suggest that tumours develop a direct extra-portal supply.

Methods

Gadolinium based perfusion MRI was performed in normal subjects, and in patients with microadenomas or macroadenomas. Scanning was performed at 3 Tesla, using a 2D single slice IR turbo flash sequence (128 x 128 matrix, 6mm thickness, 3 sec per complete image). Following pixel-by-pixel fitting of the data to a gamma-variate function, the pituitary blood supply was assessed by constructing contrast uptake maps using the fit results for amplitude and arrival time.

Results

Contrast arrived first in the upper posterior position of the gland before the anterior inferior portion in controls and patients with microadenomas (n = 6). This normal pattern was not evident in patients with macroadenomas (n = 6).

Conclusions

Our technique was able to show differential enhancement for arrival times in the anterior and posterior parts of the normal gland. Delayed arrival to the anterior gland is attributed to the effect of the HPS. The loss of this pattern in macroadenomas patients (but not microadenoma patients) supports the hypothesis that such tumours derive a systemic blood supply.

Multislice CT Angiography of the Entire Length of the Carotid and Vertebral Systems

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Speaker

Dr S Lamin

Purpose

Multislice CT has expanded the role of CT angiography by improving the temporal and spatial resolution allowing long areas to be covered with a sufficiently thin slice width to enable examinations of the aortic arch to beyond the Circle of Willis. We have applied such a technique in patients attending a one-stop TIA clinic

Methods

2.5 mm x 4 helix; pitch of 0.875; 0.5 second rotation; kVp 120; mAs 200 giving 30 cm coverage in 17.5 seconds. The scan was triggered automatically from contrast concentration in the ascending aorta, or for those patients under 55 years, the pulmonary artery

Results

Anatomical and pathological appearances were documented in the great vessels, the carotid, vertebral, basilar and circle of Willis arteries, in 50 patients with suspected T I A. In 20% no useful data on the thoracic vessels was obtained mostly due to shoulder artefact. Reflux of contrast in the jugular system occasionally obscured a vertebral origin, and swallowing artefact obliterated the carotid bifurcation in 3. Significant carotid stenosis was present in a minority of patients but none required Doppler or angiography. The intrapetrous and intracavernous carotids were best assessed on the base images. Bifurcation and great vessel disease were assessed by volume rendered cuts, using MIP or MPR to clear dense calcification and accurately measure any stenosis

Conclusions

Long length multislice CT angiography offers an effective assessment of the entire carotid, vertebral and cerebral vasculature in patients with suspected TIA.

Coiling of Middle Cerebral Artery Aneurysms : a Prospective Series of 100 Cases

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Speaker

Dr C Soh

Purpose

Middle cerebral artery aneurysms are a common site for ruptured aneurysms and represent the commonest site to cause death from ruptured aneurysms (1). They have been reported to be often difficult to treat endovascularly and MCA aneurysms were a little under-represented in the ISAT study. We present the results of a large prospective case series of MCA aneurysms treated endovascularly.

Methods

Prospective case series of 100 patients with MCA aneurysms presenting for endovascular treatment. Patients were stratified according to WFNS grade at time of treatment. Angiographic outcome was recorded including results of check angiography. Procedural and periprocedural complications were recorded. Patient outcome was assessed using the Glasgow Outcome score at follow-up.

Results

Unruptured MCA aneurysms treated with coiling represented 20% of our series. Good outcome was overall achieved in 90%, including 96% of WFNS Grade 1 presentations, with no complications arising from treating unruptured aneurysms. 9 technical complications were noted and 2 of these resulted in permanent neurological disability. Cases of incomplete occlusion due to deliberate preservation of branch vessels arising adjacent to the neck were generally stable on follow-up angiography. 5 cases were recoiled due to neck or sac recurrence and 1 was referred for surgical clipping. Rebleeding occurred in one patient following coiling. Angiographic follow-up ranged from 6 to 76 months post-coiling.

Conclusions

A large proportion of MCA aneurysms can be successfully treated endovascularly. The morphology of different MCA sub-groups is analysed and the particular interventional challenges inherent in each group are discussed.

References

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Volume-Rendered MR Angiography for the Demonstration of Intracranial Aneurysm Morphology

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Speaker

Dr D Birchall

Purpose

To evaluate the efficacy of three-dimensional volume-rendered MR angiography for the demonstration of intracranial aneurysm morphology.

Methods

24 consecutive patients (13 female, 11 male, age range 35 - 73 years) undergoing investigation for intracranial aneurysm were prospectively entered into the study, with each patient undergoing digital subtraction angiography (DSA) and MR angiography for the evaluation of intracranial aneurysm morphology. Fifteen patients were undergoing investigation for acute subarachnoid haemorrhage or headache, with the remaining 9 patients undergoing long-term follow-up for previously detected unruptured aneurysms. 30 saccular aneurysms were detected, with size range 2 - 8 mm (average 4 mm). MR imaging was performed on a Philips Intera 1.5T scanner. In each case, MRA data was post-processed using volume-rendering software available on the Philips workstation, and images were obtained to show aneurysm neck morphology to best advantage. Standard time-of-flight (TOF) MRA images were also obtained. DSA, volume-rendered MRA and TOF MRA images were reviewed by two observers. The clarity with which neck morphology was demonstrated in each case was scored using a simple scoring system (3 = excellent, 2 = moderate, 1 = poor).

Results

All aneurysms were identified on DSA and MRA. Using DSA, morphology scores were 3(excellent visualisation) in 48%, and 2(moderate) in 52%. Using volume-rendered MRA, scores were 3 (excellent) in 83% and 2 (moderate) in 17%. Using TOF MRA, scores were 3 (excellent) in 10%, 2 (moderate) in 52%, and 1 (poor) in 38%.

Conclusions

Volume-rendered MRA images demonstrate aneurysm neck morphology significantly better than DSA and TOF-MRA. The post-processing is quick and easily done, and adds diagnostic information that can significantly influence patient management.

Aneurysmal Subarachnoid Haemorrhage - Newcastle Non-Randomised Study

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Speaker

Dr A Gholkar

Purpose

To follow management pathways for the patients with aneurysmal subarachnoid haemorrhage who were not randomised in ISAT. To document and compare management outcome of these patients at discharge, 2 months and 1 year.

Methods

Ethical approval was obtained. All patients not randomised in ISAT were prospectively registered in the study between 27.2.01 and 2.5.02. The reasons for non-randomisation and selection of specific treatment path were documented. Patients were followed from admission to discharge and a record was made of any adverse events or additional procedures. Further documentation of patient outcome at discharge, 2 months and at 1 year was made. In all cases, this was performed by the use of both postal questionnaires and interview.

Results

The study included 122 patients. The age range was between 26-87 (mean 55.04) years. The majority (72.1%) of the patients were female. Ten patients were managed conservatively, 67 were treated by surgery and 45 had endovascular treatment. All patients treated conservatively had poor outcome. Of the patients treated with surgery, 40.03% at discharge and 46.3% at 2 months had good outcome. Of the patients treated with endovascular technique, 62.2% at discharge and 68.9% at 2 months had good outcome. Initial statistical analysis applying the chi-square test showed a significant co-relation between specific management strategy and clinical outcome ($P = 0.023$ at discharge and $P = 0.018$ at 2 months).

Conclusions

Even in non-randomised population with aneurysmal subarachnoid haemorrhage, endovascular treatment consistently produces better outcome compared to surgery or conservative management.

The Intradural Vertebral Artery as a Source of Subarachnoid Haemorrhage: Are Both Vessels Imaged Adequately With Unilateral Vertebral Catheterisation?

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Speaker

Dr TJ Hampton

Purpose

The guidance in the current literature on the subject of cerebral angiography suggests that unilateral vertebral artery catheterisation is adequate if the contralateral PICA origin is opacified by reflux. Recent figures suggest that of ruptured aneurysms resulting in subarachnoid haemorrhage (SAH), up to 10% will be dissecting vertebral aneurysms(1). Furthermore up to 14% of these will be located in the intradural segment proximal to the PICA origin(1,2). We performed a retrospective study to assess whether this segment is adequately imaged with unilateral catheterisation.

Methods

We reviewed the reports of the 50 most recent cerebral angiograms performed at our institution for the investigation of SAH to determine the incidence of unilateral vertebral catheterisation. The contralateral vertebral artery was assessed to determine: (1) If the intradural segment was opacified along its whole length and (2) If it was imaged in at least two planes.

Results

20/50 patients undergoing angiography, (40%) had unilateral vertebral artery catheterisation. In 19 of these the intradural segment of the contralateral vertebral artery was opacified along its entire length but in only 11 (55%) was it imaged in at least two planes. Over a separate 12 month period 7/20 (35%) patients with SAH and no source of haemorrhage identified at angiography underwent unilateral catheterisation. In 5 cases the contralateral vertebral artery was opacified along its whole length but in only 1 case (20%) was it imaged in at least two planes.

Conclusions

The intradural segment of the contralateral vertebral artery is usually opacified along its entire length by a unilateral injection but is often not imaged adequately in at least two planes. An oblique view may remedy this. The proportion of patients undergoing unilateral vertebral catheterisation is less when no source of haemorrhage is identified.

1 Kurata A et al. AJNR 2001;22:11-18

2 Mizutani T et al. Neurosurg 1995;36:905-913

A Biomechanical Explanation for the Analgesic Effect of Vertebroplasty?

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Purpose

Vertebral body fracture reduces compressive stiffness of vertebral motion segments and increases loading of the posterior annulus and neural arch, which may be painful. The aim of this study was to determine if vertebroplasty can reverse these fracture-induced changes.

Methods

Ten motion segments, consisting of two vertebrae and the intervening disc and ligaments, were dissected from eight cadaveric spines (aged 72-90 yrs). Each specimen was compressed at 1.5kN in moderate flexion and extension while intradiscal stress profiles were obtained using a miniature pressure transducer. Compressive stiffness in flexion was also measured. Vertebral body fractures were then induced and vertebroplasty performed using a standard technique. Stress profiles and compressive stiffness measurements were repeated following fracture and vertebroplasty respectively. Stress profiles were used to determine the load distribution between the disc and neural arch (1).

Results

Following fracture, the average compressive load resisted by the neural arch increased from 21% to 42% ($p<0.044$) in flexion, and 39% to 68% ($p<0.009$) in extension. Vertebroplasty reduced neural arch load bearing to 26% ($p<0.035$) in flexion and to 61% in extension ($p<0.074$). Consequently, there was no significant difference in neural arch load bearing between pre-fracture and post-vertebroplasty measurements in flexion. Mean compressive stiffness decreased from 3919N/mm to 1314N/mm ($p<0.004$) following fracture and increased to 1651N/mm ($p<0.005$) following vertebroplasty, but remained lower than pre-fracture values ($p<0.038$).

Conclusions

Vertebroplasty wholly or partially reversed the fracture-induced increase in neural arch load-bearing, and this biomechanical effect may partly explain the analgesic effect of vertebroplasty.

References

1. Pollintine P. et al. (2001). Transactions of the Orthopaedic Research Society, San Francisco, USA.