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March, 2008	ONTENTS	Vol. 56 Iss	ue 1
Editorial			
'Aqualisation' of neuraxis: Wondrous neu	raqua CSE 1		
Manu Kothari, Atul Goel			1
View and Review			
Organization of neurology services in Ind	ia: Unmet needs and the way forward		
Mandaville Gourie-Devi			4
Original Articles			
Endoscopic management of brain absces	SSES		
Yad Ram Yadav, Mallika Sinha, Neha, Vijay	' Parihar		13
Pattern of cerebellar perfusion on single A clinical and computed tomography cor	photon emission computed tomography in sub relation	ocortical hemato	oma:
Jayantee Kalita, Usha K. Misra, Prasen Ra	njan, P. K. Pradhan		17
Imaging features in Hirayama disease			
Hemant A. Sonwalkar, Rakesh S. Shah, Fir Sukalyan Purkayastha	osh K. Khan, Arun K. Gupta, Narendra K. Bodhey, Sur	rjith Vottath,	22
Delayed habituation in Behcet's disease			
Sefa Gulturk, Melih Akyol, Hulusi Kececi, S	edat Ozcelik, Ziynet Cınar, Ayse Demirkazık		27
Erythrocyte indicators of oxidative chang	ges in patients with graded traumatic head inju	ry	
Chandrika D. Nayak, Dinesh M. Nayak, Ani	naswamy Raja, Anjali Rao		31
Repeat gamma knife radiosurgery for rec	current or refractory trigeminal neuralgia		
Liang Wang, Zhen-wei Zhao, Huai-zhou Qi	n, Wen-tao Li, Hua Zhang, Jian-hai Zong,		
Jian-Ping Deng, Guo-dong Gao			36
Taste dysfunction in vestibular schwanne	omas		
Rabi Narayan Sahu, Sanjay Behari, Vimal I	K. Agarwal, Pramod J. Giri, Vijendra K. Jain		42
Surgical management of traumatic intrac	pranial pseudoaneurysms: A report of 12 cases		
Xiang Wang, Jin-Xiu Chen, Chao You, Min	He		47
Expression of truncated dystrophin cDNA	As mediated by a lentiviral vector		
Sun Shunchang, Chen Haitao, Chen Weido	ong, He Jingbo, Peng Yunsheng		52
Gamma knife radiosurgery for glomus iu	gulare tumors: Therapeutic advantages of mini	malism in the sk	ull base
Manish S. Sharma, A. Gupta, S. S. Kale, D	. Agrawal, A. K. Mahapatra and B. S. Sharma		57

Neurology India

March, 2008

CONTENTS

Vol. 56 Issue 1

Case Reports

Subarachnoid hemosiderin deposition after subarachnoid hemorrhage on T2*-wei with the location of disturbed cerebrospinal fluid flow on computed tomography c	ghted MRI correlates isternography	
Yoshifumi Horita, Toshio Imaizumi, Yuji Hashimoto, Jun Niwa		62
Anesthesia management of awake craniotomy performed under asleep-awake-asl laryngeal mask airway: Report of two cases	eep technique using	
Gadhinglajkar Shrinivas Vitthal, Rupa Sreedhar, Mathew Abraham		65
High cervical C3-4 'disc' compression associated with basilar invagination		
Atul Goel		68
Short-lasting unilateral neuralgiform headache with conjunctival injection and tea to antiepileptic dual therapy	ring: Response	
Ravi Gupta, Manjeet S. Bhatia		71
Correlation of autism with temporal tubers in tuberous sclerosis complex		
Kavitha Kothur, Munni Ray, Prahbhjot Malhi		74
Non-traumatic carotid dissection and stroke associated with anti-phospholipid an Report of a case and review of the literature	tibody syndrome:	
Benzi M. Kluger, Richard L. Hughes, C. Alan Anderson, Kathryn L. Hassell		77
Osteoma of anterior cranial fossa complicated by intracranial mucocele with emplits radiological diagnosis	hasis on	
Jinhu Ye, Hui Sun, Xin Li, Jianping Dai		79
Vasospasm after transsphenoidal pituitary surgery: A case report and review of th	e literature	
Manish Kumar Kasliwal, Ravinder Srivastava, Sumit Sinha, Shashank S. Kale, Bhawani S.	Sharma	81
Chondromyxoid fibroma of the seventh cervical vertebra		
Ashish Jonathan, Vedantam Rajshekhar, Geeta Chacko		84
Acute progressive midbrain hemorrhage after topical ocular cyclopentolate admin	istration	
Tarkan Calisaneller, Ozgur Ozdemir, Erkin Sonmez, Nur Altinors		88
Letters to Editor		

Digital subtraction angiography laboratory with inbuilt CT (DynaCT): Application during intracranial anurysm embolization 90 Concomitant tuberculous and pyogenic cerbellar abscess in a patient with pulmonary tuberculosis 91 Drug complianceafter stroke andmyocardial infarction: Is complementary medicine an issue? 93

Neurology India

Free full text at www.neurologyindia.com and www.bioline.org.br/ni

March, 2008 CONTENTS Vol. 56 Issue 1

	Multiple intracranial developmental venous anomalies associated with complex orbitofac vascular malformation	ial	93
	Nitrofurantoin-induced peripheral neuropathy:A lesson to be re-learnt		94
	Posterior longitudinal ligament cyst as a rare cause of lumbosacral radiculopathy with po leg raising test	sitive straight	96
	Aqueductal stenosis caused by an atypical course of a deep collector vein draining bilater developmental venous anomalies	ral cerebellar	97
	Recovery of increased signal intensity of the cervical cord on magnetic resonance imagin for spontaneous spinal epidural hematoma causing hemiparesis	g after surgery	98
	Simultaneous thalamic and cerebellar hypertensive hemorrhages		100
N	euroimages		
	MRI and MRA in spontaneous intracranial arterial dissection		

Referees List - 2007	000???	
Instructions to Authors	106	
Forthcoming Events	105	
Susceptibility weighted imaging in holohemispheric venous angioma with cerebral hemiatrophy Sivaraman Somasundaram, Chandrasekharan Kesavadas, Bejoy Thomas	104	
Shunt catheter migration into pulmonary arteries Miikka Korja, Matti K. Karvonen, Arto Haapanen, Reijo J. Marttila	103	
MRI and MRA in spontaneous intracranial arterial dissection S. Raghavendra, Sanjeev V. Thomas, Krishnamoorthy Thamburaj, Bejoy Thomas	102	

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Digital subtraction angiography laboratory with inbuilt CT (DynaCT): Application during intracranial anurysm embolization

Sir,

It is known that early recognition and management that occur during a neuroendovascular procedure complications can improve clinical outcome.^[1,2] A new combined angiography/CT suite has been developed that uses flat-panel detector (FD) technology for higherresolution angiography that is also capable of producing CT-like images.^[3]

A 32-year-old female patient presented with subarachnoid hemorrhage. Digital subtraction angiography with 3-D angiography revealed an internal carotid artery bifurcation aneurysm along with spasm in the adjacent vessels [Figure 1A]. The option of endovascular coil embolization was decided upon and was performed in the same session. Under roadmap guidance, microcatheter (Excelsior SL 10, Boston Scientific Corporation, USA) was carefully guided over a microguidewire (Agility 10, Cordis, Johnson and Johnson, USA) into the aneurysm. During microcatheter placement, wire was seen to cross the margin of the aneurysm and immediate angiogram revealed rupture of the aneurysm with extravasation of contrast into subarachnoid space [Figure 1B]. Heparin was immediately reversed with protamine and a coil (GDC soft 3x8, Boston Scientific, USA) was placed into the dome of the aneurysm. Repeat angiogram did not reveal any more extravasation of the contrast [Figure 1C]. Further embolization was performed with GDC soft 2×4 and 2×2 coils with almost complete occlusion of the aneurysm [Figure 1D]. Thereafter, DynaCT was performed in the angiography room without shifting the patient and the images [Figure 1E and F] revealed minimal contrast in the subarachnoid space with no obvious hematoma, mass effect or change in ventricular size. Intra-arterial vasodilatation was performed with 0.5 mg of nimodipine with decrease in arterial vasospasm. Patient was extubated with no change in neurological status and was discharged after a few days with intact neurological status.

Intraoperative rupture of aneurysm is a known complication of aneurysm embolization and is reported in 2-3% of patients. Such patients may need an immediate external ventricular drain (EVD) or hematoma evacuation. In our case, there was a dilemma



Figure 1: A 32-year-old female presented with subarachnoid hemorrhage due to an internal carotid artery bifurcation aneurysm (A). During embolization, aneurysm ruptured with extravasation of contrast (Arrow, B). Heparin reversal and coil placement stopped the bleeding (C). Further coil placement resulted in almost complete occlusion of the aneurysm (D). DynaCT (E and F) was immediately performed in the angiography suite which revealed minimal hyperdensity in subarachnoid space (Arrow, F) with no hematoma formation or ventricular dilatation. Arrow in Figure. E indicates coil artifacts

whether to continue with the procedure, do an EVD or to shift to CT scan to assess the intracranial status. Shifting the patient to regular CT scan would have meant stopping the interventional procedure as well as loss of time while the patient was shifted to the CT scanner. It would also have resulted in moving the patient out of the relatively sterile environment to a relatively open/unsterile atmosphere of the CT scanner. DynaCT technology enabled us to do the intracranial assessment within a few minutes in the angiography lab while the intervention was continued. It helped us in accurate and immediate assessment of the situation and helped in avoiding any unnecessary surgical procedure such as EVD. We were able to complete the endovascular procedure including the intra-arterial vasodilatation as was needed in the case.

The images produced by DynaCT are not of the quality of conventional CT. However, as our case demonstrates, current DynaCT image quality is sufficient to make a diagnosis when a complication is suspected, particularly to detect hemorrhage.^[4] This technology is likely to be useful in other intracranial endovascular procedures. In the management of acute stroke, DynaCT can be performed to exclude intracranial hemorrhage before planning intra-arterial thrombolysis. This technique can also be useful to detect intracranial hemorrhage during embolization of intracranial arteriovenous malformations. This technology is also being used for clear visualization of stents in both intracranial and extra-cranial arteries and helps in visualizing both the stent struts and their relationship to the arterial walls and the aneurysmal lumen. This helps in accurate placement of stents as well as in some cases in assessment of wall pathology such as presence of calcification.^[5] In head and neck embolization procedures using direct percutaneous access, in combination with fluoroscopy, DynaCT can be used for more precise needle placement. The radiation exposure during DynaCT was approximately 49 mGy, which is less than that during head scan using conventional CT scanner (recommended dose of 60 mGy).

Capability of performing CT scan-like images in the angiographic suite is likely to help in early detection of complications during neuroendovascular procedures and will help in proper decision-making and is likely to play a crucial role in the coming years.

V. Gupta, M. Chugh, B. S. Walia¹, S. Vaishya¹, A. N. Jha¹

Interventional Neuroradiology, ¹Department of Neurosurgery, Max Institute of Neurosciences, Max Superspeciality Hospital, 1 Press Enclave Road, Saket, New Delhi - 110 017, India. E-mail: vipulgupta25@yahoo.com

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