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1.

Reduction of blood loss in spine surgery by large doses of tranexamic acid: a prospective blinded randomized controlled study

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Aim

Tranexamic acid (TA) is an antifibrinolytic drug, which is used routinely to reduce bleeding in cardiac surgery. However, its use in neurosurgery is uncommon and only a few studies have reported the use of antifibrinolytic drugs in spine surgery. The aim of the study was to find out the effect of a large dose of tranexamic acid on blood loss during spinal operations.

Method

The study was carried out at King Khalid University Hospital (Riyadh, Saudi Arabia) during the period: 6/2005 to 12/2006. It was a double-blinded randomized placebo controlled study. All patients undergoing spinal surgery who were anticipated to have significant blood loss were included in the study. Patients with coagulopathies were excluded from the study.

Results

Sixty-four patients were included in the study with 32 patients in each group (the placebo and TA). Statistical analysis showed that there was significant difference in the amount of intra-operative blood loss ($p < 0.007$) and the amount of blood transfused ($p < 0.008$) between the two group of patients. The duration of surgery and hospital stay were shorter in the tranexamic acid group but, this did not reach statistical significance. There were no complications related to the use of large doses of tranexamic acid.

Conclusion

The use of tranexamic acid during spinal surgery had significantly reduced blood loss and blood transfusion and it was not associated with complication. We strongly recommend its use during neurosurgical operations (spinal and cranial).

Competing interests

None declared

Question

- a. What was the dose of the tranexemic acid?
- b. Was there any rebound bleeding after stopping tranexemic acid?
- c. How were systemic complications from tranexemic acid sought?

Krisnan Bansal MD

Dehradun, India

Response

We thank Dr Bansal for his questions.

	Loading dose (during the induction of anaesthesia)	Maintenance dose (given during the surgery and continued 5 hours postoperatively)
Adults	2 grams in 100 cc iv	1 gram in 100 cc at a rate of 100mg/hour
Paediatric patients	2 grams in 100 cc iv	1 mg/kg/hour

Table 1: Dosage of tranexemic acid

No postoperative hemorrhagic or thrombo-embolic phenomena was noted.

Postoperatively and at clinic visits the renal and the liver function tests were done. We did not come across any systemic complications which could be attributable to tranexamic acid.

A Zakaria MD

Riyadh, Saudi Arabia

Editorial comment

Patients who undergo complex spinal surgery are at risk of considerable intra-operative blood loss and also of post-operative bleeding, The latter could leave the patient with devastating disability. Dr Elwatidy and colleagues should be congratulated on their excellent study. In their conclusion they stated that, "We strongly recommend its use during neurosurgical operations (spinal and cranial)". They indeed found that there was significantly less intra-operative blood loss and blood transfusion requirements in patients who received tranexemic acid than those who did not receive it. However, each group only had thirty-two patients. The study needs to be undertaken in a larger number of patients before firm recommendations can be made on the regular use of tranexamic acid in patients who undergo complex spinal surgery. It would be interesting know whether Elwatidy et al found any significant difference between the two groups in terms of overall clinical outcome.

2.

Morphometric and ultrastructural effect of drotrecogin alpha (active protein C) on spinal cord trauma model

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Aim

Drotrecogin alpha (active protein C) (APC) is a drug, which has multiple effects including anti-inflammatory, antithrombotic and profibrinolytic

effects. The aim of the study was to examine morphometric and ultrastructural effect of drotrekogin alpha (active protein C) (APC) on spinal cord trauma model.

Method

Sprague-Dawley rats randomly separated into three groups; I [n:7; dorsal laminectomy], II [n:7; laminectomy + spinal cord trauma using Allen's spinal cord trauma method, and III [n:7; laminectomy + trauma + 100 µg/kg recombinant protein C (activated)]. All the animals were scarified at the end of 4th week. 10 mm segments of spinal cord were removed and examined with light microscope, and transmission electron microscopes and for morphometric analysis.

Results

Between trauma and drug group, a significant statistically differences observed in respect to number of neurons and infarct area in light microscopic examinations. Electron microscopic examinations revealed differences between trauma and drug group in respect to membranes of the nuclei, the structures of the axons, myelin sheets, the mitochondrion, endoplasmic reticulum and ribosome in the favour of drug group.

Conclusion

Drotrecogin alfa had a neuroprotective effect on the traumatic spinal injury. Data make us to suggest, this drug may be reduce the effects of traumatic ischaemia with its anti-inflammatory, antithrombotic and profibrinolytic effects.

Competing interests

None

Question

What is the mechanism of action of active protein C? When is the ideal time to see the protective effects. i.e time of injury, pre or post injury

George Jallo, MD
Baltimore, USA

Response

Active protein C has anti-inflammatory, antithrombotic and profibrinolytic effect. It shows these effects via many ways: decreasing cytokines IL-1 and TNF-alfa, inhibiting intracellular calcium signal and monocyte depended T cell proliferation, inhibiting plasminogen activator inhibitor-1 (PAI-1) and limiting TAF1 (thrombin activated fibrinolysis inhibitor).

When is the ideal time to see the protective effects i.e time of injury, pre or post injury?

There are no study as far as we are aware related to what is the ideal time to administer drotrecogin alfa. In our study it was given immediate after injury and continued for 7 days.

Tayfun Hakan MD
Istanbul, Turkey

Question

Dear Dr. Hakan,

I found a similar experiment to yours by Hirose K et al (Hirose K et al. Activated protein c reduces the ischaemia/reperfusion-induced spinal cord injury in rats by inhibiting neutrophil activation. Ann Surg. 2000 Aug;232(2):272-80). Could you tell us what is the difference between your research and this one.

Abdelazeem El-Dawlatly MB ChB MSc MD
Riyad, Saudi Arabia

Response

Dear Dr El-Dawlatly,

Thank you for your comment. Our study gave similar findings, but we were able to show the ultra-structural changes with electron microscopy, too.

Tayfun Hakan, MD
Istanbul, Turkey

3.

Space-occupying cerebellar infarct: a review

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Aim

Space-occupying cerebellar infarcts (SOCI) make up a subgroup within the ischemic pathologies of the brain which are generally well tolerated clinically and usually respond well to medical treatment.

Method

Case records, computed tomographic scans, IRM case reports of 2 patients with space-occupying cerebellar infarcts defined by computed tomographic criteria were re-evaluated with regard to clinical course, etiology, therapeutic management, mortality, and functional outcome.

Results

Decompressive surgery should be the treatment of choice for massive cerebellar infarction causing progressive brain stem signs or impairment of consciousness

Conclusion

These patients must be carefully monitored because of the risk of clinical deterioration, in which case timely surgical intervention can increase their survival.

Competing interests

None

4.

The Role of Thromboprophylaxis in Elective Spinal Surgery

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Aim

The high rate of venous thromboembolism complications following neurosurgical operations is well documented. The reported incidence rates of symptomatic thromboembolic disease in spinal surgery are estimated between 0.5 to 3.4%. The

use of thromboprophylaxis in surgery has been demonstrated to improve survival outcomes and now is recommended by the National Institute for Health and Clinical Excellence (United Kingdom). However, on a practical level, these guidelines have not been universally implemented as the perceived complications of anticoagulation have outweighed its potential benefits. Therefore, its routine use is not a standard and established practice in elective spinal surgery in England. As venous thromboembolism remains a serious complication resulting in increased morbidity, mortality and cost, we have investigated the incidence of symptomatic thromboembolism after elective spinal surgery in patients given post-operative thromboprophylaxis and analysed the complications.

Method

In this retrospective study, 100 patients who underwent elective spinal surgery from March 2007 to July 2007 were analysed. A review of the case notes and electronic database was performed. In addition to demographic data, approach (anterior or posterior), the anatomical level of surgery (cervical, thoracic and lumbar), type of procedure (primary or revision), duration of surgery, start of treatment, presence of pre-existing risk factors and outcomes were all collected. All patients were given mechanical prophylaxis and low molecular weight heparin (enoxaparin 40mg OD) on their operative day. Treatment continued until the patients were fully mobile. Patients who were considered high risk for thromboembolic disease were included in this study and were treated in a similar fashion. Symptomatic thromboembolic disease was diagnosed when patients showed significant clinical signs or symptoms of a deep venous thrombosis (DVT) or pulmonary embolism (PE). In cases of suspected DVTs, diagnosis was confirmed by duplex scan of the lower limbs; furthermore in cases of suspected PEs, diagnosis was confirmed by CTPA.

Results

There was no reported incidence rate of symptomatic thromboembolic disease in this population. A total of 3 patients showed clinical signs of deep venous thrombosis; however all had negative duplex scans. A total of 2 patients were investigated for symptomatic pulmonary embolisms, but their

investigation revealed lower lobe pneumonia and a pulmonary effusion, respectively. Moreover, there were no reported deaths. A total of 5 patients had direct complications of anticoagulation: minor bleeding (haemoglobin drop ≤ 2 g/dL or transfusion ≤ 2 or more units of blood products) and local skin reaction (mild local irritation, pain, ecchymosis and erythema). All complications were reported in patients who underwent a posterior approach of the lumbar spine. A total of 1 patient was investigated for a spinal or epidural haematoma for evolving neurological signs, which in turn the underlying lesion was excluded. Patients receiving the first dose of enoxaparin ≥ 12 hours postoperatively had significantly fewer complications ($p < 0.05$). Furthermore, when inject sites were rotated the rate of local skin reaction complication were also reduced.

Conclusion

We report no incidence of clinically symptomatic thromboembolic complications following elective spinal surgery. However, complication following the administration of low molecular weight heparin related to the level of spinal surgery, surgical approach and delayed mobilisation. Moreover, we identified a number of future areas of improvement. Treatment should commence after at least 12 hours following surgery, injection sites should be rotated to minimize local skin reactions, and early mobilization should be encouraged. It would be beneficial to risk stratify patient prior to surgical intervention. In light of our findings, enoxaparin should be given to patient undergoing elective spinal surgery to prevent mortality and morbidity associated with thromboembolic disease. A prospective database will be invaluable to continue monitoring thromboembolic disease within this Neurosurgical Department.

Competing interests

Not declared

Question

“The Role of Thromboprophylaxis in Elective Spinal Surgery”

This, as we know, is a controversial subject. The trend in Europe is to utilize prophylactic

anticoagulants (usually the heparinoids rather than heparin itself) to protect against the development of deep venous thromboses and complications such as pulmonary emboli. In the United States, there is strong feeling among neurosurgeons (probably less among orthopedic spine surgeons) that the use of anticoagulants in the course of patients undergoing spinal (or intracranial) surgery is not indicated; and that the risks of bleeding phenomena are greater than those of thromboembolic complications.

Here in the USA, we tend to mobilize spinal patients immediately (except, of course, those who have severe neurological deficits); and, in the case of patients undergoing elective spinal surgery (such as surgery for disc disease), patients are usually gotten out of bed and activated on the same day as the operation.

European articles generally report low incidence of bleeding complications, including a relatively large study done in Frankfurt, Germany[1]. This study, however, containing a series of 1,954 operations done in the presence of heparinoid prophylaxis, reported a 0.7% incidence (13 patients) of “major postoperative hemorrhage”. A total of 77% of those 13 patients “showed progressive neurological deficit” and 31% were left with permanent morbidity from this complication.

In an American article from Winston-Salem, North Carolina[2], it is stated that “search of the limited peer-reviewed literature on the subject indicates that there is an anecdotally high risk of complications in patients who have undergone spinal surgery and in whom a Level 1 or equivalent heparin protocol is administered.” It is further suggested that the placement of an inferior vena cava filter may be more prudent in patients who are subject to the possibility of pulmonary embolism following spinal surgery

My question therefore is: Have you compared the incidence of thromboembolic phenomena (and their risks, including pulmonary embolism) with the risks of hemorrhagic complications (such as epidural and/or subdural hematoma, paraplegia, quadriplegia, and other serious neurological complications)?

A second question would be: Would you make a distinction as to the age and medical status of the

patient when deciding for or against prophylactic use of anticoagulants? It would appear that the incidence of deep venous thrombosis and/or pulmonary embolism in young, healthy individuals would not justify exposure of those patients to the risks of hemorrhagic complications.

Robert A Fink MD FACS

Berkeley

[1] Gerlach R, Raabe A, Beck J, Woszczyk A, Seifert V. Postoperative Nadroparin administration for prophylaxis of thromboembolic events is not associated with an increased risk of hemorrhage after spinal surgery. *Eur Spine J*, 2004;13 (1):9-13

[2] Barnes B, Alexander JT, Branch CL Jr. Postoperative level 1 anticoagulation therapy and spinal surgery: practical guidelines for management; *Neurosurg Focus*. 2004;17(4) : E5

Response

Dear Dr. Fink,

Thank you very much for reading our presentation and for your interesting comments and questions.

This is indeed a controversial issue and it is interesting to note in The United States that there is a strong feeling among Neurosurgeons that the use of anticoagulants in the course of patients undergoing spinal (or intracranial) surgery is not indicated.

In the UK, there are also concerns about the potential hemorrhagic complications with the use of anticoagulants for thromboprophylaxis.

However, venous thromboembolism also presents a major burden on our healthcare system and each year 25,000 people die from venous thromboembolism (in medical and surgical patients). In our department, we also encourage early mobilization to decrease the risk of venous thromboembolism but the National Institute of Clinical Excellence and Health have recently produced new guidelines (April 2007) on reducing the risk of venous thromboembolism in patients undergoing surgery (including neurosurgery). Their recommendations for Neurosurgery (including spinal surgery) include:

Patients having neurosurgery should be offered mechanical prophylaxis.

Patients having neurosurgery with one or more risk factors for venous thromboembolism (please see below) should be offered mechanical prophylaxis and LMWH.

Patients with ruptured cranial or spinal vascular malformations (for example, brain aneurysms) should not be offered pharmacological prophylaxis until the lesion has been secured

Patient-related risk factors for venous thromboembolism

- Active cancer or cancer treatment
- Active heart or respiratory failure
- Acute medical illness
- Age over 60 years
- Antiphospholipid syndrome
- Behcet’s disease
- Central venous catheter in situ
- Continuous travel of more than 3 hours approximately 4 weeks before or after surgery
- Immobility (for example, paralysis or limb in plaster)
- Inflammatory bowel disease (for example Crohn’s disease or ulcerative colitis)
- Myeloproliferative diseases
- Nephrotic syndrome
- Obesity (body mass index > 30kg/m²)
- Paraproteinaemia
- Paroxysmal nocturnal haemoglobinuria
- Personal or family history of VTE
- Pregnancy or puerperium
- Recent myocardial infarction or stroke

- Severe infection
- Use of oral contraceptives or hormonal replacement therapy
- Varicose veins with associated phlebitis
- Inherited Thrombophilias for example:
 - High levels of coagulation factors (for example, Factor VIII)
 - Hyperhomocysteinaemia
 - Low activated protein C resistance (for example, Factor V Leiden)
 - Protein C, S and antithrombin deficiencies
 - Prothrombin 2021A gene mutation

Patients undergoing elective spinal surgery often fulfil one of the risk factors in recommendation 2.

In our retrospective study of 100 patients who underwent elective spinal surgery from March 2007 to July 2007 all patients were given mechanical prophylaxis and low molecular weight heparin (enoxaparin 40mg OD) on their operative day.

In answering your first question, we found that there was no reported incidence rate of symptomatic thromboembolic disease in this population. A total of 3 patients showed clinical signs of deep venous thrombosis; however all had negative duplex scans. A total of 2 patients were investigated for symptomatic pulmonary embolisms, but their investigation revealed lower lobe pneumonia and a pulmonary effusion, respectively. Moreover, there were no reported deaths. A total of 5 patients had direct complications of anticoagulation: minor bleeding (haemoglobin drop ≤ 2 g/dL or transfusion ≤ 2 or more units of blood products) and local skin reaction (mild local irritation, pain, ecchymosis and erythema). All complications were reported in patients who underwent a posterior approach of the lumbar spine. A total of 1 patient was investigated

for a spinal or epidural haematoma for evolving neurological signs, which in turn the underlying lesion was excluded. Patients receiving the first dose of enoxaparin ≥ 12 hours postoperatively had significantly fewer complications ($p < 0.05$). Furthermore, when inject sites were rotated the rate of local skin reaction complication were also reduced.

In answering your second question, the guidelines from NICE recommend mechanical thromboprophylaxis in all patients undergoing elective surgery but recommend the addition of LMWH in patients if they have at least one of the above risk factors for venous thrombolism (including age). For young, healthy individuals without any of the listed risk factors for deep venous thrombosis and/or pulmonary embolism and are not likely to be immobile for a prolonged period, anticoagulation would not justify exposure of those patients to the risks of hemorrhagic complications.

VA Elwell MRCS

London, UK

5.

Case report: Cystic meningioma

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Aim

We report the management of a single case of a cystic meningioma and review the relative literature.

Method

We report a single case of a cystic meningioma treated surgically with stereotactic aid.

Results

A 57-year-old female presented with a history of numbness of the left upper extremity and episodes of headaches. CT and MRI scans were performed revealing a large cystic lesion located at the right parietal lobe with a nodule part at the circumference.

The imaging characteristics of the lesion revealed a cystic meningioma with a differential diagnosis of a cystic astrocytoma. A total, stereotactically aided resection of the tumor was achieved.

Conclusion

Cystic meningiomas are an uncommon histologic type of tumour accounting for 1.7%-11.7% of all intracranial meningiomas. Their imaging characteristics are mimicking cystic astrocytomas but they demonstrate different prognosis and require different operative strategies.

Competing interests

None

Question

Dear Dr Filippidis,

Thanks for sharing your experience about cystic meningioma. It is fascinating how the cystic component can grow to such considerable size and becomes responsible for the patients symptoms. I had seen one before and like you mentioned before that experience cystic meningioma was never on my list of differential diagnosis for cystic lesions in brain. I would appreciate your views on the following:

1. Can we draw any analogy between these tumours and haemangioblastomas? Are there any histological or other similarities? The theories of cyst formation seem to hold true for both.

2. Can we make an inference about the rate of cyst formation? Surely the patient's presentation was due to mass effect from the cyst and presumably aetiology dictates the rate of fluid accumulation.

3. There is only a T1W in the presentation, can you tell us the degree of oedema in the surrounding brain.

Likhith Alakandy FRCS (SN)

Glasgow, UK

Response

Dear Dr Alakandy,

Thank you for your insightful comments.

My answers are the follows:

1. Can we draw any analogy between these tumours and haemangioblastomas? Are there any histological or other similarities? The theories of cyst formation seem to hold true for both.

The relationship of haemangioblastomas and/or identity with angioblastic meningiomas is controversial. Although almost 10 cases of angiomatous meningiomas are demonstrated in a series of 103 cystic meningiomas(1) which should demonstrate similar cystic formation to haemangioblastomas. The theories of cyst formation seem to be true in both of them and we think that it is the only common characteristic. Various theories (1,2,3,4) have been implied like CSF entrapment, microvacuole accumulation, tumor necrosis and accompanying fluid migration, vascular leakage.

We should also address the rising issue of molecular tumoral signature in the means of a novel water channel transporter (5,6,7) "Aquaporin" in both of these tumors. Do they share the same aquaporin profile? Literature implies that aquaporin may be the cornerstone of edema formation and cystic tumoral evolution in brain tumors. This hypothesis seems to sculpture the molecular profile and morphological correlation of this brain tumors. This is a nice research perspective isn't it?

1. Senbokuya N, Asahara T, Uchida M, Yagishita T, Naganuma H. Atypical meningioma with large cyst. Case report. *Neurol Med Chir (Tokyo)*, 2006;46(3):147-51.

2. Gläsker S, Vortmeyer AO, Lonser RR, Lubensky IA, Okamoto H, Xia JB, Li J, Milne E, Kowalak JA, Oldfield EH, Zhuang Z. Proteomic analysis of hemangioblastoma cyst fluid. *Cancer Biol Ther*. 2006; 5(5): 549-53. Epub 2006 May 6.

3. Chen Y, Tachibana O, Hasegawa M, Xu R, Hamada J, Yamashita J, Hashimoto N, Takahashi JA. Absence of tight junctions between microvascular endothelial cells in human cerebellar hemangioblastomas. *Neurosurgery*. 2006;59(3): 660-70; discussion 660-70

4. Fortuna A, Ferrante L, Acqui M, Guglielmi G, Mastronardi L. Cystic meningiomas. Acta Neurochir (Wien). 1988; 90(1-2): 23-30.

5. Chen Y, Tachibana O, Oda M, Xu R, Hamada J, Yamashita J, Hashimoto N, Takahashi JA. Increased expression of aquaporin 1 in human hemangioblastomas and its correlation with cyst formation. J Neurooncol. 2006; 80(3):219-25

6. Papadopoulos MC, Saadoun S, Davies DC, Bell BA. Emerging molecular mechanisms of brain tumour oedema. Br J Neurosurg. 2001; 15(2):101-8. Review.

7. Aquaporin-4 is correlated with peri-tumoural oedema in meningiomas. WL Tan, JH Wong, D Liew, and IH Ng Ann Acad Med Singapore, 2004; 33(5 Suppl): S87-9

2. Can we make an inference about the rate of cyst formation? Surely the patients presentation was due to mass effect from the cyst and presumably aetiology dictates the rate of fluid accumulation.

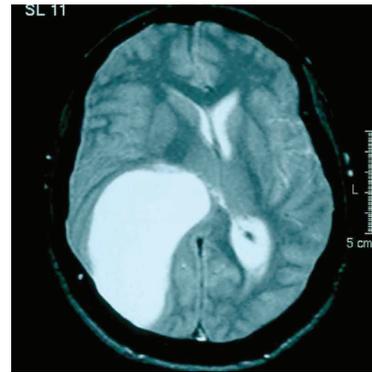
Literature states that usually cystic meningiomas present with an increased cystic component as this stated by tumor/cyst ratio. So, symptoms arise from the tumoral mass effect. Also it is stated(1) that "symptoms to diagnosis interval" in cystic meningiomas is about 8-9 months (from 10 days to 2,5 years). In our case the "symptoms to diagnosis" interval is 2 months. We should mention that biopsy indicated a meningothelial subtype which is benign and shows slow growth. The large extension of the cystic component is disproportionate to the clinical evidence which demonstrate slow evolution and not severe neurological deficit. The conclusion seems to show a slow cyst formation rate that of course cannot be estimated using current data.

1. Weber J, Gassel AM, Hoch A, Kilisek L, Spring A. Intraoperative management of cystic meningiomas.

3. There is only a T1W in the presentation, can you tell us the degree of oedema in the surrounding brain.

The peritumoral edema demonstrated in T2W image

(attached image) is minimal. This supports the opinion that in this case the mass effect originated mainly from the cystic component of the tumor.



Aristotelis Filippidis MD

Larissa, Greece

Response

Dear Dr Narenthiran,

thank you for your accurate comments.

My answers are:

1. What was the appearance of the cystic fluid. Was it clear or straw coloured?

The appearance of the cystic fluid was xanthochromic and the cytology revealed that it contained few meningothelial cells. This is the usual picture.

2. What the histological sub-type of the meningioma? was it meningothelial or microcystic or other?

The subtype of the neoplasm is meningothelial as stated by one of our slides in the biopsy results and we considered it benign as WHO guidelines indicate. I also mentioned that fluid cytology confirmed the presence of few free meningothelial cells.

3. How did the patient do following the operation?

The 2-month postoperative results were excellent since the patient did not demonstrate any post-op complication and the rigorous physiotherapy program

help her gain her normal muscle strength without

any neurological deficit.

4. From you reading on this matter, what is the recurrence rate of cystic meningioma. Does presence of meningioma cells in the cyst fluid associated with increased recurrence?

The recurrence of cystic meningiomas ranges according to histological type.

Benign tumors demonstrate 2% recurrence in 5 years whereas atypical meningiomas show 38% 5 year recurrence and anaplastic show 32,4-78% recurrence rates(1)

We should also mention that type II cystic meningiomas tend to recur. Some authors state that malignant types should receive fractionated radiotherapy (50 Gy) of the cystic wall(2)

It has been demonstrated, in a case submitted by Weber et al (1), the possibility to find 2 distinct tumor sites in one cystic meningioma wall. This phenomenon tends to appear in anaplastic tumors that show an increased ability to grow and metastase. The authors state that the cytologic examination of the cyst's fluid revealed free anaplastic cells while the imaging studies and intraoperative data confirmed the presence of two distinct tumor sites in a cystic wall. The clue is that we should ALWAYS aspirate the fluid and arrange a cytology examination. The results should inform us about the possibility of recurrence and further treatment follow-up.

1. Weber J, Gassel AM, Hoch A, Kilisek L, Spring A. Intraoperative management of cystic meningiomas. Neurosurg Rev. 2003; 26(1): 62-6. Epub 2002 Review

2. Senbokuya N, Asahara T, Uchida M, Yagishita T, Naganuma H. Atypical meningioma with large cyst. Case report. Neurol Med Chir (Tokyo). 2006; 46(3): 147-51.

Aristotelis Filippidis MD

Larissa, Greece

6.

Management of penetrating craniocerebral injuries from nail-gun use

Selvanathan S, Goldschlager T, McMillen J, Campbell

S

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Aim

Outcome of closed gentle traction in the management of penetrating craniocerebral nail-gun injuries with extracranial extension.

Method

Three cases of penetrating craniocerebral nail-gun injuries with no vascular involvement and with extracranial extension were selected. Preparations for craniotomy and/or endovascular intervention was made in case of any haemorrhagic or ischaemic sequelae. In all three cases the nails were removed via closed gentle traction craniotomy and/or endovascular support.

Results

The nails were removed successfully. Post-operatively all three patients had an uneventful recovery and remained fully conscious with no neurological deficits. A post-operative CT scan revealed no signs of intracranial haemorrhage.

Conclusion

If angiography is negative for vascular involvement and the patient is asymptomatic, the nail can be extracted via closed gentle traction. However patients with vascular symptoms or nail with no extracranial extension should be considered for craniotomy.

Competing interests

Nil

Comment and question

Dear Dr. Selvanathan,

Thank you for your contribution and sharing with us your presentation.

In my recent experience with both management of intracranial and cervical penetrating foreign bodies

and removal of penetrating objects (branches, nail gun and taser injuries), I recommend a couple pearls and perhaps some additional criteria to be considered in conclusion:

In the case of foreign body intracranial penetrating objects, such as nails deployed from a nail gun and tasers, it is useful if possible to obtain an undeployed and deployed but unpenetrated foreign body for examination prior to and during operative intervention.

In a recent case of cervical (C3) vertebral body penetration by a nail gun, it was found that although vascular and neuro-imaging studies indicated proximity to the vertebral artery, there was no obvious violation. When a similar nail, a 34 pneumatic Cd coated nail, was obtained and closely examined it was found that there are very small projections or barbs from the nail that protrude and expand upon pulling/traction pressure. Intra-operatively, a sterile nail was brought into the field to assess optimal retraction without causing neurovascular injury. It was determined that the penetrated nail needed to be rotated appropriately 90 degrees or appropriately 180 degrees in order to have the correct conformation for extraction. This enabled the sharp sidewall barb structures along the nail to be able to clear the critical neurovascular structures and the vertebral artery on the C3 nerve root. In this case, after an open approach was performed in order to optimally access the foreign body and avoid neurovascular injury, the nail was slowly retracted until it was entirely pulled out. As a result intra-operative vascular studies and post-operative neuroimaging should be encouraged and be carefully assessed if neurovascular proximity is suspected. In the case of cervical nail gun penetration, despite entirely extricating the nail, it was also found that on post-operative neuro-imaging small retained metallic prongs which had penetrated the vertebral body remained. In conclusion, nails from nail guns can potentially cause harm when an attempted closed retraction is attempted, despite no obvious pre-operative evidence of injury. This may also be further indication that consideration for an open approach be made and a possible contra-indication for simple closed retraction when in proximity of neurovascular structures.

In a similar presentation of a patient with a

transcranial taser deployment, it was also helpful to assess complete extraction of the foreign body for comparison with an intact foreign body specimen. Again, the conformation of the taser bullet may lend itself to a retained portion if it fragments.

Another recent presentation was of a retained intracranial fragment and associated abscess which was a result of an orbitocranial penetrating foreign body which underwent simple closed retraction prior to transfer of care. In this case, a second tailored skull base approach was implemented to completely remove the foreign body, perform a debridement/wash-out and simultaneously avoid proximal neurovascular injury.

Additional thoughts:

As always, detailed study of the neurovascular relationships with the foreign body will guide the method of its removal after appropriate exposure. The risks of direct clamp removal lies in the variability and lack of knowledge of the exact physical relationship of the foreign body with the various ocular and/or intracranial contents at the time of closed extraction. Incomplete extraction using only a closed technique has been previously reported and should be avoided if possible.

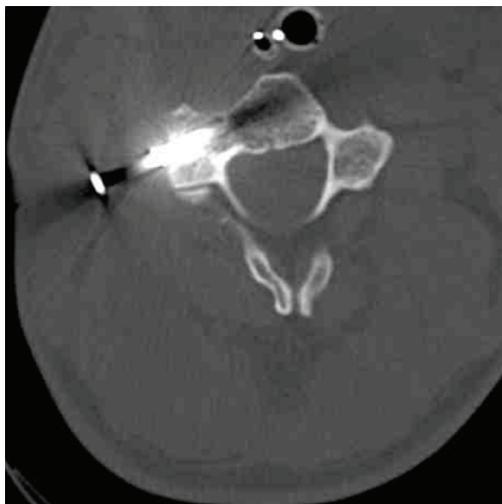
The treatment approach should be tailored to the anatomic location of the foreign body penetration. In cases that involve the anterior and middle cranial compartments, it is beneficial to utilize a tailored skull base approach to extract the penetrating foreign bodies completely. Further injury to adjacent neurovascular structures can be avoided by a timely therapeutic intervention designed to definitively address the primary problem, thereby avoiding the secondary sequelae that can result from a delayed or incomplete treatment modality.

It is significant that intracranial penetration by a foreign body has been associated with a 48% incidence of brain abscess and 25% mortality rate in the literature. As mentioned in your presentation, appropriate antibiotic coverage should be instituted.

In light of the above, and despite lack of obvious neurovascular involvement in the cases presented, what is your plan for short-term, long-term follow-up in each case? Would your management &/or

intervention be any different in the future?

Angio right vertebral injection



Clara Raquel Epstein MD PC
Bexley, Ohio, USA

No response provided by the authors.

7.

The Technical Importance of Decreasing the

Tension inside the Neck and Dome during Aneurysm Surgery- Specially Big and Giant Aneurysms

Quintana Leonidas, Massaro Paolo, Gonzalez Francisco, Yokota Patricio

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Aim

The surgery for big and giant cerebral aneurysms, always is an interesting challenge to the neurosurgeon.

The problems, that may happen during a very tense aneurysm neck and dome are: (1) Neck impossible to clip, (2) Main artery stenosis due to clip migration, (3) Rupture of aneurysm neck, and (4) Dome difficult to manage.

Method

In this presentation, 3 cases of big aneurysms are presented.

One case of ruptured big ACA aneurysm, with wide neck at the right A2 portion, one case of ruptured big left MCA aneurysm, with wide neck, and one case of ruptured right MCA aneurysm with very wide neck.

The edited videos are presented , showing the surgical techniques employed.

The brain protection during the temporary clipping was performed with propofol, to decrease the cerebral metabolic need, and nimodipine plus mannitol to improve the collateral circulation to the brain area under circulatory arrest.

Results

Based in our experience in managing 760 aneurysms operated cases, from 1990 to 2006, after decreasing the endoluminal tension, during temporary clipping, under brain potection, it is possible to: 1-Open the dome,2-Extirpation of endoluminal clots, 3-The walls of the dome become more easy to dissect from neighbouring arteries, 4- the neck become relaxed,5-The dome is more easy to mobilize, and 6- Easy and safety clipping of the neck is possible to perform.

Conclusion

Under Brain Protection using temporary clipping to decrease the tension of the aneurysm neck and dome, the surgery of big and giant aneurysms is more safely performed and gives the surgeon more possibilities to get successful results.

Competing interests

None

Question

I have just looked through the list of papers presented at the Conference and I am very impressed with the variety and global sources. I am particularly impressed by the video technology used by Dr. Leonidas in his paper concerning the surgical treatment of aneurysms and reduction of tension within the neck of such.

Would Dr. Leonidas or one of his associates describe the technique which he used for the production of the video sequences, and would you, Naren, discuss how you were able to include these clips into the Conference. The clarity and ability to stop, reverse, and repeat the video is much more helpful than when videos are presented at “live” conferences.

Robert A. Fink MD FACS PC
Berkeley, California

Response

Thanks a lot for your kind comment. We use a software , PVR plus, to capture some sequences of the operation. about 5 to 10 seconds. And after that, using the same software or the X video Converter we proceed to fuse the sequences. By this way, we showed the most remarking parts of the operation.

Thanks a lot again

Prof Dr Leonidas Quintana
Valparaíso, Chile

Response

Dear Dr Fink,

You had asked: “would you, Naren, discuss how you were able to include these clips into the Conference. The clarity and ability to stop, reverse, and repeat the video is much more helpful than when videos are presented at “live” conferences.”

In the last few years video technology over the web has had something like a ‘paradigm shift’ with the arrival of a new format: Flash video

Flash video is highly compressed while retaining good quality. This has made transmitting high quality video over the web or from web-cam very practical.

Previous formats for video were produced by specialists in video technology (mpeg4, .mov). This then had to be incorporated into web pages with web-authoring programs (Dreamweaver, Adobe GoLive).

However, the Flash Video is brought to us by the same company that also develops the best web-authoring program (Dreamweaver) - now owners are Adobe.

While Microsoft has a format (.wmv) which is a good format for web, it would not run on Macintosh computers (unless you install wmv players for Mac). However, Flash Video works on both Windows and Mac platforms. You just need to download and install the free Flash Player.

How to publish Flash video on the web:

The program ‘Adobe Flash’ (professional version) comes with the ‘Flash video encoder’. You can convert most video formats to Flash video with the Adobe Flash encoder. Then I created a web-page with ‘Adobe dreamweaver’ and insert the created Flash video. When you insert the Flash video with the Adobe Dreamweaver, the codes for ‘video controls’ are automatically incorporated into the web-page. Then you just have to publish the web page along with the video file on your web-server.

In fact little programming knowledge is needed for the whole process. However, while working with computers a lot of patience is needed...to deal with computer crashes, internal conflicts etc etc

I hope I have addressed your questions.

G Narenthiran MRCSE
Southampton, UK

Question

Dear Professor Quintana,

Congratulations on your work and elegant video

presentations!

Have you used balloon occluders placed around the arteries of circle of Willis to control intraluminal flow? If you have, what was your experience with it? Please find a paper on this technique attached to this e-mail.

G Narenthiran, MRCSE
Southampton, UK

Response

Dear Dr Narenthiran

Thanks for your comments. Recently, we have two endovascular neurosurgeons, so, from 8 monthes ago we have tried some cases using balloon occlusion(the same way as Thorell et al, and also we have tried supraclinoid ICA complex aneurysms using the technique described by Batjer and Samson (Batjer HH, Samson DS. Retrograde decompression of giant paraclinoidal aneurysms. Technical notes. J Neurosurg 1990; 73: 3056.), with puncture of ICA at cervical portion, suction and decrease the tension inside the neck and dome. Always using brain protection , described in our work.

Prof Dr Leonidas M Quintana MD
Valparaíso, Chile

8.

Is it possible to predict facial nerve function after vestibular schwannoma surgery? A clinical and radiological analysis.

Gerganov VM, Nouri M, Luedemann W, Samii A, Samii M

International Neuroscience Institute, Hannover, Germany.
vgerganov@gmail.com

Aim

To determine if the preoperative clinical and radiological features are reliable in predicting facial nerve function after vestibular schwannoma (VS) surgery. The main shortcomings of most of the previous studies were the heterogeneous characteristics of the analyzed groups.

Method

A retrospective study of 99 consecutively operated patients with VS. Data collected included the main clinical features and the following radiological parameters: tumor size, volume, extension in relation to the internal auditory canal, width and length of the intrameatal tumor portion; tumor-fundus distance, and changes of the internal auditory canal. Statistical analysis has been performed with both parametric and nonparametric tests.

Results

Headache as initial symptom gait instability and facial nerve function at presentation were negative predicting factors. Tumor growth in all directions had significant correlation with facial outcome, but anterior and/or caudal had more significant correlation than posterior and/or inferior extension. Polycystic tumors had the worst prognosis. Neither intrameatal length nor width and tumor-fundus distance influenced significantly the outcome.

Conclusion

The preoperative analysis of the neuroradiological images and of neurological status of the patient could give reliable clues regarding the chance of preserving good facial nerve function after surgery.

Competing interests

None

Question

This study shows what (common practice has told us for long time) that the larger the tumor the worse is the post-op facial nerve function. As pre-op evaluation is intuitive that poor facial nerve function will be predictive of post-op poor function as well. Can you explain why gait and, in particular, headache should be correlated with poor post-op facial function? Is it still related to the size of the tumor? The larger the more pre-op symptoms patients have?

Mario Zuccarello, MD; Cincinnati, USA

Question

Dear Dr Gerganov,

I have studied your presentation with enthusiasm since I have seen that apart from clinical possible

predictors you have meticulously included morphometric imaging data in relation to the target site anatomy. It is a quite brilliant thought and I hope that these data would aid our microanatomical understanding of the region.

I would like to ask you about other factors that literature seems to address in facial nerve function prediction after vestibular schwannoma surgery.

Apart from factors that pre-exist, like clinical presentation and tumor morphology, I think that we should address the issue of intraoperative manipulation near the target lesion and the facial nerve. Literature shows (1,2,3) that intraoperative facial nerve monitoring during vestibular schwannoma surgery in the means of neurophysiological and EMG parameter studies seems to correlate with facial nerve functional outcome. These papers are only indicating of the work done under the fields of facial nerve intraoperative monitoring.

1) Do you utilize intraoperative facial nerve monitoring during your surgical interventions ?

2) What is your personal opinion about intraoperative facial nerve monitoring ?

3) In case that you use monitoring, are there any data, concerning your research, that show correlation ?

4) I have noticed that during your conclusion you found that headache demonstrates significant correlation to the outcome. Do you feel that the presentation of headache in a patient with VS is an early sign of increased ICP that would correlate with increased incidence of facial nerve or nuclei compression and thus a greater damage to facial nerve function?

I would like to thank you in advance for you time,

Aristotelis Filippidis MD

Larissa, Greece

1. Isaacson et al. Intraoperative monitoring and facial nerve outcomes after vestibular schwannoma resection. *Otol Neurotol.*, 2003; vol. 24 (5) pp. 812-7

2. Fenton et al. Predictive factors of long-term facial nerve function after vestibular schwannoma surgery.

Otol Neurotol., 2002; vol. 23 (3) pp. 388-92

3. Goldbrunner et al. Quantitative parameters of intraoperative electromyography predict facial nerve outcomes for vestibular schwannoma surgery. *Neurosurgery*, 2000; vol. 46 (5) pp. 1140-6; discussion 1146-8

Question

I read with interest the presentation by Gerganov et al, on the association between clinical and radiological factors and early facial nerve function after vestibular schwannoma (VS) surgery. The authors concluded that preoperative analysis of the neuroradiological images along with neurological status of the patients could give reliable clues regarding the chance of preserving good facial nerve function, postsurgery.

Although the rate of reported facial nerve preservation after VS surgery continuously increases, facial nerve paresis or paralysis is a frequent postsurgical sequelae of major concern. While I appreciate the attempt made by Gerganov et al, I would like to make a commentary on their study.

One popular method for distinguishing independent predictors and to determine their relative contribution to the outcome is multivariate regression. By regression analysis, one can look for independent linear associations between several potential predictors and an outcome. Using artificial neural networks (ANN), one can identify both linear and nonlinear associations. Consequently, the explanatory power of this method in terms of outcome variation is often superior to regression analysis. The functioning ANN's knowledge is built on learning and experience from previous input data. On the basis of this prior knowledge, a trained ANN can predict relations found in newly presented data sets. Regression and ANN are popular methods to predict a clinically important outcome which depends on several or a complex combination of a few risk factors.

In this study, univariate analysis including the chi-square, t-test, Kruskal-Wallis and Mann-Whitney based on variables' types was performed while the second-step analyses such as logistic regression or AAN is lacking. The potential confounding effect of each clinical or radiological factor on early facial

nerve function should be assessed by the above mentioned second-step analyses in order to find the really independent predictive factors. For example, the results showed that headache or gait instability was correlated with poor post-operative facial function but it seems that these clinical factors are probably confounded by the effect of tumor size and volume.

In conclusion, the results obtain from a subsequent analysis (regression or ANN) will propose a rather small set of variables as a good predictor, when using in the appropriate model. Furthermore, it can be inferred from the statistical equality of the predictive ability of the regression and ANN models that the set of variables selected predicts early facial nerve function in a more or less linear manner. It is noteworthy that each variable might have a highly complex nonlinear relationship with the outcome, the combination of all of which is fairly linear however.

Mehdi Abouzari MD

Tehran, Iran

No responses was provided by the authors

9.

Outcome evaluation of chronic subdural haematoma using Glasgow outcome score

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Aim

The relationship between Glasgow Outcome Score (GOS) and its probable effective factors has not been determined, yet. The purpose of this study was to evaluate whether GOS at discharge as a measure of outcome is correlated with its effective factors in patients with chronic subdural hematoma (CSDH).

Method

One hundred and sixteen consecutive patients with CSDH were studied. The variables considered were age, sex, trauma-surgery interval, type of surgery,

type of trauma, Glasgow Coma Score (GCS) on admission, hematoma density, and postoperative hospitalization. The relationship between type of surgery and postoperative hospitalization was also studied.

Results

There were no significant relationship between age, sex, type of trauma, and postoperative hospitalization and GOS. On the other hand, shorter trauma-surgery interval ($P=0.015$), lower GCS ($P<0.001$), and higher hematoma densities ($P=0.001$) had significant association with unfavorable outcome as defined by GOS. Burr-hole craniostomy had shorter postoperative hospitalization when compared with small craniotomy ($P=0.003$).

Conclusion

Higher hematoma densities, lower GCS, and shorter trauma-surgery interval increase the risk of unfavorable outcome after CSDH. Burr-hole craniostomy is more cost effective procedure when compared with small craniotomy because of its shorter postoperative hospitalization.

Competing interests

None

Question

I congratulate the authors on their work on this common but intriguing clinical problem.

Was the association between shorter trauma-surgery interval with unfavourable outcome due to the fact that in early stages there would be higher incidence of recurrence because of higher density of the haematoma; or was this a completely independent factor (forgive my ignorance of the statistics if they have already answered this in their talk)

the other point i would like to make is if they have looked at the Hounsfield units of the haematoma as well (rather than classifying into hypo, iso and hyperdense only) and if there is any correlation between a particular range of Hounsfield units and favourable outcome . If not, this may be something to look in future studies as well.

Khalid Saeed FRCS(SN)

Greater Manchester, UK

Question

Interesting presentation by Abouzari M

Did you attempt to study the effect of factors like volume of the hematoma, bilateral hematomas, presence of the membrane, medical conditions, presence of preoperative focal neurological deficits etc.on the outcome?

Any of these patients received additional drain either with burr hole/craniostomy?

I find you have a wide range of hospital stay for these patients. Do you have an outcome measurement at later stage of follow up(3 months / 6 months)? do you have break up of mortality with respect to pre-op GCS

Did all 17 patients who died postoperatively had poor GCS? When you are considering subdural hematomas within few days of trauma with CT scan showing hyperdense hematoma, we should make sure we are not dealing with acute subdural hematomas

Promod Pillai MD
Columbus, Ohio, USA

Response

We thank Dr. Pillai and Mr. Saeed for their thoughtful comments on our presentation. The study was conducted in a setting with limited facilities and we fully agree that it had a number of limitations. However, we tried to answer some of these questions in our next studies (1-4). In a recent study we evaluated for the first time, the association between Glasgow outcome score (GOS) at discharge (as a known measure of outcome) and chronic subdural hematoma (CSDH) recurrence in 82 patients who underwent burr-hole surgery (1). The trauma-surgery interval was not significantly different between recurrence and non-recurrence group (P = 0.06) while a high density hematoma was significantly associated with recurrence of CSDH (P < 0.001). Previous studies except two (which showed that a shorter interval predisposes to recurrence) support our results (5-8). We agree with Mr. Saeed; it seems that the association between shorter trauma-surgery interval and unfavorable outcome could be

due to higher incidence of recurrence in high density hematomas.

As a limitation in the present study, we didn't attempt to study the effect of hematoma width or bilateral hematomas on outcome but again we didn't find significant association between these issues and outcome in our next studies (1, 2). However, of the two previous studies that have evaluated the role of hematoma thickness, the result in one is in agreement with ours, but that in the other contradicts ours (6, 8).

In order to eliminate the confounding effect of medical conditions, patients with one or more risk factors that already had been documented to influence outcome (receiving anticoagulant or thrombolytic drugs, organization of the CSDH, ventriculoperitoneal shunt, and history of diabetes, seizure or alcohol abuse) were excluded from the study. Finally, none of our patients received additional drain and outcome measurement was not evaluated at later stage of follow up. We did not also break up mortality with respect to preoperative Glasgow coma score.

In conclusion, this study was a retrospective study using univariate analyses for data analysis. A prospective case-control method with the groups carefully matched or even studies using logistic regression analysis might be good alternatives to more accurately evaluate the outcome of CSDH. Finding the correlation between a particular range of Hounsfield units and CSDH outcome might be a good option in future studies as noted by Mr. Saeed.

Mehdi Abouzari MD
Tehran, Iran

10.

Practical Algorithm for Surgical Management of Facial Pain

Slavin KV, Colpan ME, Munawar N, Nersesyan H

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Aim

Despite multiple recent advances, a choice of appropriate surgical approach to various categories of facial pain remains confusing. The goal of this presentation is to introduce a simple and practical algorithm for surgical treatment of medically intractable facial pain.

Method

Based on our clinical experience, we analyzed the decision tree in choosing appropriate surgical intervention based on the nature of the facial pain, its location and patterns, presence of other contributing or causative factors, imaging findings, patient's medical condition and ability to withstand certain interventions, as well as willingness to have surgery, and summarized it into a simple algorithm, usable in routine medical practice.

Results

With a simple set of questions, it is possible to establish the likely diagnosis for each particular patient and then come up with a rational choice of one of the ten procedures listed in the algorithm tree. Use of this algorithm has shown itself both easy and reliable in approaching most facial pain patient categories. More than 100 consecutive patients have been treated with the algorithm assistance achieving a very high initial success rate.

Conclusion

The presented algorithm may be utilized in routine clinical practice and seems to provide guidance for both experienced surgeons and relative beginners of the field. This algorithm may be validated only by use in larger group of the patients and in multiple institutions.

Competing interests

None

Question

Is there any outcomes data to support the allegation that using this algorithm will increase favorable outcomes and reduce complications?

Patients are often satisfied because the doctor tried to help them, whether or not pain relief has occurred. Recurrences happen over time; hence outcomes

must be stated with duration of followup or using a Kaplan-Meyer plot to gain meaningful information.

Putting experimental procedures in a treatment algorithm is misleading, as motor cortex stimulation and trigeminal stimulation are not approved in US and are not paid for by public or private insurance.

Gamma Knife does not appear in the algorithm, yet it is one of the standard therapies in this country.

Hope my comments are useful.

John D. Loeser MD

Seattle, USA

Response

Thank you for your thoughtful comments!

Is there any outcomes data to support the allegation that using this algorithm will increase favorable outcomes and reduce complications?

The data presented here reflect our practical approach to the facial pain patients that come to the attention of a neurosurgeon. The outcome will be calculated in a long-term follow up study that is currently underway. So far, we have no information to conclude about potential increase in chances of favorable outcome for those whose treatment was guided by this algorithmic approach; the algorithm is intended to facilitate the surgeon's approach to each individual patient.

Patients are often satisfied because the doctor tried to help them, whether or not pain relief has occurred. Recurrences happen over time; hence outcomes must be stated with duration of follow-up or using a Kaplan-Meyer plot to gain meaningful information.

The patient satisfaction is determined by the immediate pain relief (upon discharge from the hospital) which is different from overall patient satisfaction with treatment that very well may be, as you correctly pointed, significantly affected by the physician's attitude. At this point, lack of long-term follow up prevents us from creation of Kaplan-Meyer curves, but this has already been done by Drs. Loeser, Burchiel and others in the past applicable to each discussed procedure.

Putting experimental procedures in a treatment algorithm is misleading, as motor cortex stimulation and trigeminal stimulation are not approved in US and are not paid for by public or private insurance. The definition of “experimental” procedure varies from country to country – and in my opinion, lack of FDA approval in the US does not make a procedure automatically “experimental” particularly in those countries where a large experience with them is gained over the years (i.e., motor cortex stimulation in France). Interestingly enough, both trigeminal nerve stimulation and motor cortex stimulation are frequently covered by private insurers. Medicare would pay for them if they are done within an approved research protocol. Leaving these procedures out of the algorithm would leave many conditions untreatable and the entire algorithm incomplete.

Gamma Knife does not appear in the algorithm, yet it is one of the standard therapies in this country.

Gamma Knife is indeed included in the algorithm – as stereotactic radiosurgery. It is an important part of our armamentarium and is recommended to all patient who have primary or secondary trigeminal neuralgia and do not want (or cannot) have open surgical intervention. It is listed on slides 3, 5, 8 and 10.

Konstantin Slavin MD

Chicago, USA

Sorry, I missed stereotactic radiosurgery when I questioned the lack of G-K in your diagram. Thanks for putting your ideas out there for all to see.

John D Loeser MD

Seattle, USA

11.

Accuracy of intra-operative rapid diagnosis by SQUASH smear in central nervous system lesions - An early institutional experience

Bansal M, Sanjeev K, Srivastav R, Raghuvanshi S, Saini M, Asthana V, Agarwal S, Singh DK, Mittal M, Deepak G, Bansal KK.

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Aim

Intra-operative cytological diagnosis of the CNS lesions helps the neurosurgeon to decide about the extent of resection particularly in eloquent areas. The squash or crush preparation of the available tiny tumour tissue at the start of the resection is a time saving and lead to better decision on further plan of surgery. This study was conducted to find out the accuracy of this technique at our center.

Method

We have prospectively studied the accuracy of this technique at our institute. During the period of last 2 years we have operated 118 CNS mass lesions including cranial and spinal included in the study.

Results

Our early experience concluded that Intra-operative SQUASH smear cytology is a fairly rapid and reliable method of intra operative diagnosis for a wide spectrum of central nervous system lesions.

Conclusion

Out of total 118, cranial lesions were 105 and spinal were 13. Males outnumbered in frequency (77 cases, 65.2%) while the females comprised 41 cases (34.7%). Most (59.2%) of the patients were from 20 to 50 years of age. The cerebral hemisphere including all lobes had the largest number of cases (49 cases, 41.5%). Among them glial tumors form the major group (34 cases, 28.8%). Meningiomas were the next main group (18 cases, 15.3%) followed by schwannomas and metastatic tumors having 9 cases (7.7%) each. The cytological or squash diagnosis was possible in all except 11 cases (9.3%), in which a definite diagnosis could not be provided due to fibrous tissue, necrosis, and hemorrhage or poor preservation of cytological features.

Competing interests

None declared

Question

Dear Dr. Bansal,

I believe your group achieved great work regarding

intraoperative rapid diagnosis of neurosurgical lesions.

I have several questions regarding your data. Please teach me further details of your work.

1. Do you do frozen section simultaneously? If so, how was the correlation between these two modalities?

2. Was this technique useful when diagnosing glioma infiltration to surrounding normal brain? Namely, can we detect invading cells to the normal brain with this technique?

3. The diagnosis of "astrocytoma" is rather frequent. Is this mean that it includes "astrocytoma grade 4" as a smear diagnosis or you cannot differentiate grade of astrocytic tumors with this technique?

If so, is there any way to improve the diagnosis of glioblastoma?

4. How was the "failure" rate with this technique? Was there any occasion when the pathologist cannot make diagnosis at all?

5. I know this technique is useful in diagnosing malignant lesions. You applied this to arachnoid cysts or epidermoid cysts or vascular lesions. How were the diagnosis of these lesions?

Takamitsu Fujimaki MD PhD

Tokyo, Japan

Question

The presentation is interesting but my main question would be with regards to the assessment of the diagnostic utility of the test (the intra-operative diagnosis). It would be interesting to know what the sensitivity, specificity, positive and negative predictive values are. It would be interesting to know how their figures compare with others who have published similar data. The other thing I wondered was how many pathologists had reported the cases (i.e. were all cases reported by one pathologist or are these results from several pathologists pooled together).

Dr Mark Walker

Southampton, UK

Comment

I seldom rely upon intraoperative neuropatholgy results as they so infrequently alter your surgery.

I don't use smear or frozen at all for image-guided biopsy. False negatives and false positives combined with the extremely high diagnostic yield (>99%) without intra-op pathology suggest to me that it is seldom useful.

During tumour resection I also find it rarely useful. For smaller lesions I have found tumour removal completed before the results are available. For larger cases it very rarely changes your surgical strategy - to remove all macroscopic disease if possible.

We all know that most primary intrinsic tumours infiltrate beyond the macrosopic and radiologic boundaries and that surgery is not curative. I know of no good evidence that the use of intra-op path to look for 'clear margins' for glioma surgery makes any difference to outcome. The 5-ALA work suggests that if you use flourescence you will resect a little more tumour, but that outcome is no different

Paul Grundy BM(Hons) MD FRCS(SN)

Southampton, UK

No responses were provided by the authors.

12.

Cervical cord injury: comparison of clinico-radiological picture with mode of injury

Bansal KK, Gupta C, Mittal M, Goel D

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Aim

To find out the severity of cord injury in relation with mode of injury. Cervical cord injury is a potentially devastating consequence of acute trauma. This disastrous and crippling disease occur very frequently among whole spinal column and accounts for 5% of Roadside accidents (RSA). The prognosis of cord injury has direct relation with mode of injury, making it hard to evaluate other indicators of improvement without considering them. The most common types of cord injury include

contusion or compression. Other types of injuries include lacerations, and central cord syndrome or simple whiplash injury.

Method

We have retrospectively analyzed 37 patients of cervical cord injury admitted during last two years in our institute, which is in foothills of Himalayas. We categorized them into four groups- A) Fall from height (FFH), B) Road side accidents, C) Accidental injury due to carrying heavy weight over head D) Trivial Trauma in Pre-existing spondylotic spine, to compare the clinical and radiological features with mode of injury.

Results

Among these most of the patients (19) had cord injury following fall from height, ten patients got injured in RSA, five of them received accidental injury while carrying weight over head and rest of them belonged to fourth group. Sex ratio shows male predominance (29:8) with mean age of 32 years at the time of injury. Mid cervical region (C4-5) was most common site of injury in twenty-seven patients while five each had involvement of upper (C1-3) and lower (C6 and below) cervical region. 19 patients out of 37, presented with complete cord injury, with and without respiratory muscles involvement, 15 had incomplete cord injury and rest three patients had no neurological deficit. All patients of RTA group and nine patients of FFH group had complete injury while none of the third group had complete

injury. All these patients were screened with plain X-rays, lateral view of cervical spine and Magnetic Resonance Imaging of cervical spine. Twenty two patients (all patients of RTA and 12 patients of FFH) showing fracture dislocation of vertebral bodies with cord contusion and haematomyelia, with complete type of cord injury, but varying degrees of subluxation found to have mere cord edema with clinical picture of incomplete cord injury, in rest of the patients. Out of three patients with pre-existing spondylosis, two had increment of disc bulges with cord compression and oedema but the rest one had haematomyelia with contusion in addition.

The Frankel scale has been used for the assessment of patients for neurological and functional classification of spinal cord injury (SCI). All patients of RSA group were found to have Frankel grade 1 neurological deficit, while less than half patients from FFH group had similar deficit. Rest other patients who belonged to group B, C & D, were had better Frankel scale.

Conclusion

Spinal cord injury is frequently occurring and preventable problem. The severity of which depends upon the mode of injury. High-speed accidents in RSA leads to complete cord injury type of picture, while in other categories the severity of disability is easily manageable with relatively good outcome..

Competing interests

None