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CONTEMPORARY MANAGEMENT OF TRIGEMINAL NEURALGIAS

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Overview based on literature review and personal experience (2478 patients referred for trigeminal neuralgia)

First step is to recognize, with appropriate investigations, symptomatic neuralgias. As an example, they accounted for 3.6 % in our series of 2478 patients referred over the 28 past years for appearently a primary Trigeminal Neuralgia (TN). Symptomatic neuralgias are generally treated with success by attempting at the radical cure of the causative lesion. When multiple sclerosis (MS) is suspected, MR imaging is completed with electrophysiological and CSF biological investigations.Thermorhyzotomy is the treatment most often used for MS patients. In our series of 72 MS patients, results were constantly good, but recurrences were frequent; redoing thermorhyzotomy was generally effective.

The key-examination for diagnosis is encephalic MRI including cervico-occipital junction.It allows to evidence: Chiari-malformation, platybasia, small-capacity posterior fossa,brain-stem lesions, cerebello-pontine angle tumors or vascular malformations,cavernous sinus neoplasias,as well as any type of skull base pathologies in relation with the trigeminal nerve. Special MRI studies, as for instance SPGR MR, may help to identify vascular images at the contact of the trigeminal root.When they are pronounced and the root dislocated, these images constitute arguments for a Neuro-Vascular Conflict (NVC) at the origin of the neuralgia. Our experience on hundreds of MRI for Primary TN leads us to estimate that the absence of an obvious image of NVC frequently coexists with a clearcut NVC at surgery, and that vascular images in the close vicinity of the root are far from to correspond to the real conflicting vessels seen intraoperatively.

The second step is the choice of the surgical method. Surgery has to be indicated only after having checked that the classical medical treatment with anticonvulsants has been rigorously applied and controlled by a neurologist. The fact that during posterior fossa exploration, a NVC was almost constantly found in patients referred for primary TN - that is in 96.7 % of our 579 patients studied (9) - leads us to propose the Micro-Vascular Decompression (MVD) procedure (2, 4) as the first surgical treatment. All candidates need a general examination, so that the anesthesiologist controls that the patient ‘s general conditions are compatible with general anesthesia and open surgery. On that basis, we performed 726 MVD procedures over the past 24 years.

When the patient is considered too aged (70 – 75 years seems to be a”sensible” limit) and /or having a precarious general status,a percutaneous procedure,under slight neuro-sedation and short-lasting general IV anesthesia, is indicated.The thermorhyzotomy procedure according to Sweet’s technique (13) has our preference. Over the past 28 years, we performed 1752 of such a procedure, mainly for elderly patients. But Glycerol injection (3) or Balloon compression (6) are chosen by many other teams as the first percutaneous procedure.The recently

developed stereotactic radiosurgical Gamma-knife treatment (5) is progressively taking a place in the neurosurgical armamentarium for intractable TN.

MicroVascular Decompression (2, 4) is based on the hypothesis that the main responsible factor of the neuralgia is a NVC at the level of the root,especially at the Root Entry Zone (REZ). In our series of 579 cases studied (9), an elongated Superior Cerebellar Artery (alone or in association with other conflicting vessel(s)) was found in 88% of the patients,an Anterior-Inferior Cerebellar A. in 25.1%, a vein embedded in the nerve in 27.6%, the Basilar A. in 3.5%.Of prime importance,several conflicting vessels were found in association in as much as 37.8% of the patients.Missing one of these multiple vessel(s) could lead to failure or recurrence

Location of the NVC was at the REZ in 52.3%, at the midthird of the root -i.e., at its cisternal portion- in 54.3%, and at the exit of the root from Meckel Cave in 9.8%. This means that the entire root has to be explored from brainstem to porus of Meckel Cave.

The degree of severity of the conflict was a simple contact with the nerve in 17.6%, a distorsion of the nerve in 49.2%,and a marked indentation in 33.2%.

In addition, alterations of the whole root were frequently observed.In 42% of the patients, the nerve had a significant degree of global atrophy, likely related to a coexisting" neuropathy " of the trigeminus.In 18.2%,there was a local thickening of arachnoid membranes,adherent to the root.In 12.6%,the root had a marked angulation on crossing over the petrous ridge.Finally in 3.9%,the nerve was compressed between pons and petrous bone,due to small size of posterior fossa. In our practice we found it of importance, in addition to transposing away the offending vessel(s), to free the root from all the arachnoidian adhesions and to reroute it as normally as possible.

As regard to the procedure, most surgeons agree to consider important the following technical points (7):

- Patient placed on the table in the contralateral lying position, the head moderately elevated,slightly flexed and rotated 15° toward the contralateral side;

- Retromastoid craniectomy, of the key-hole type,made just posterior to the base of the mastoid process,so as to expose the dura in the angle formed by the transverse and the sigmoid sinuses;

- Trigeminal nerve accessed via infratentorial-supracerebellar route, along the superior petrosal sinus, not to retract from lateral-to-medial the cerebellum and consequently stretch the 7th-8th nerve complex as well as the labyrinthine artery;

- Large opening of the arachnoid around the superior petrosal veins,so as avoiding their avulsion and preventing venous infarction of the cerebellum ; care must be taken not to damage the tiny trochlear nerve especially with the sucker.The least opening of the arachnoid in front of the 8th nerve, the less hearing complications.

-To prevent damaging the trigeminal root during decompression,release from the vascular compression has to be performed without manipulations of the nerve with the surgical instruments.Attempt to dislodge the offending vessel(s) is better made by gently pulling on the vessel(s) with small tapes of Teflon fiber felt passed around.The vessel(s) is (are) transposed away and then kept apart,better by means of a prosthesis but without contact to the nerve so as to avoid "neocompression" (12).

- Throughout the vascular manoeuvers, application of drops of Papaverine in saline is important to antagonize mechanical vasospastic reactions in the arteries.

-To make dura watertight, a piece of subcutaneous fascia taken from the operative wound is affixed extradurally ;and if mastoid cells were largely opened,rather than waxing it is better to pack with fat tissue harvested from as for instance the thigh.

Long-term follow-up studies, with actuarial curve calculation, show that MVD is able to provide a stable cure of the disease in more than three-quarters of the cases (1, 11).In our series of 579 patients followed for 3 to 20 years,9 y on average,the success rate was 76.1%.Mortality was 0.30% and severe neurological

complications (cerebellar ischemic stroke) another 0.30%.

Percutaneous techniques are lesioning methods, and must be better reserved for elderly patients. RF-Thermorhyzotomy, as developed by Sweet (13), has our preference because more accurate, provided performed precisely.The method is based on the existence of a somatotopia in the trigeminal fibers, not only at the level of the Gasserian ganglion but also of the triangular plexus and the adjacent portion of the sensory root,the two later being the ideal target for the thermo-lesion. The ophtalmic fibers (V 1) are situated in a supero-medial,the mandibular(V 3) in an infero-lateral and the maxillary (V 2) in an intermediate location ; the motor (masticatory) root courses independently, more medially, from a superior position in the CPA cistern to an inferior location in the Meckel Cave trigeminal cistern.The best location of the tip of the electrode to achieve the optimum effect on pain with the minimum side-effects or complications is the immediate retro-gasserian part of the root,i.e., the triangular plexus,as demonstrated through our series (10).

An accurate control of the appropriate location of the electrode needs intraoperative fluoroscopy and even more an electro-stimulation test, prior performing the thermo-lesion (8). The use of a current with a frequency of 5 HZ makes it possible, not only to evoke paresthesias in the trigeminal territory (which necessitates the patient awake),but also to produce clinically observable motor twitches in the face (that can be noticed by the surgeon himself). These twitches may, not only affect the masticatory muscles - being Direct Masticatory Responses (DMR) to the direct stimulation the motor root -, but also muscles innervated by the facial nerve -being Evoked Motor Responses (EMR), hypothesized to correspond to trigemino-facial reflexes elicited by the stimulation of the sensory rootlets -. So, navigation within the trigeminal system under X-Ray and using Neurophysiologic Guidance does help to locate the uninsulated tip of the electrode in the optimal place, that is in the sensory fibers corresponding to the trigger-zone at the level of the triangular plexus (Sindou 1999). The right location is –at the same time - the one in which threshold for eliciting DMR is high and threshold for evoking facial EMR in the trigger-zone is low.EMR in Orbicularis oculi is indicative of location in the rootlets corresponding to V 1 territory ; EMR in Levator labii, of V 2 territory rootlets; EMR in Orbicularis ori, of V 3.When twitches cannot be clearly seen in the lower face (which is not rare) and pain is in V3 and /or V2, one may rely on the progressive cessation of twitches evoked in the upper part facial muscles while the electrode is slowly withdrawn from a supero-medial to an infero-lateral position in the triangular plexus region. The landmark of the later on lateral X-Ray is the crossing between upper ridge of petrous bone and clivus.

In our series of 1752 patients operated on since 1975 and up to now (average follow-up: 14 years), the procedure produced relief of pain in all but 3 pts. With a marked degree of hypoesthesia in the trigger zone - deliberately searched -,the overall recurrent rate was as low as 7%. 6% of patients complained of dysesthesias and 2% of disabling hypoesthesia ;there was corneal hypoesthesia in 16%,with episodes of (reversible) keratitis in 5%.

In Conclusion, the surgical management of idiopathic trigeminal neuralgia needs to have recourse to two types of procedures.The first type, the MVD, is directed to the main causative factor, i.e., the NVC; it is conservative and curative ; but it is an open operation with some potential vital risks. The second type is represented by the percutaneous techniques ; they are lesioning and palliative methods ;but being less invasive, they can be useful in aged patients with precarious general conditions. In the future, it might be that the stereotactic radiosurgical Gamma-Knife technique replaces –at least partly - the percutaneous methods.

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DRUG-DELIVERY TO THE SPINAL CORD TAGGED WITH NANOWIRE ENHANCES NEUROPROTECTIVE EFFICACY AND FUNCTIONAL RECOVERY FOLLOWING TRAUMA TO THE RAT SPINAL CORD

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Drug delivery to the spinal cord or brain following injury is still a serious problem because of the presence of blood-brain and blood-spinal cord barriers [1, 2]. Thus, various methods are used to enhance drug delivery to the CNS in normal or in pathological conditions to achieve therapeutic success [2]. Recently, drugs attached to innocuous nanowires are considered as a suitable method for enhanced delivery within the central nervous system (CNS). There are few reports in the literature that indicates that drugs when delivered in combination with nanowires; their therapeutic efficacy is enhanced [see 1]. However, most of these investigations are carried out in vitro models. Thus, these novel aspects of therapeutic enhancement of drugs or compounds tagged with nanoparticles require additional investigation using in vivo models.

This investigation was undertaken to examine whether drugs attached with nanowires when applied over the traumatized spinal cord in rats may have better therapeutic efficiency compared to the parent

compound in terms of neurological outcome and/or spinal cord pathology.

For this purpose, 3 different compounds named SCI1, SCI2 and SCI5 (Acure Pharma, Sweden) having potential neuroprotective efficacy in CNS injury were identified and tagged with TiO2-based nanowires using standard procedure. Normal compounds were used for comparison. Spinal cord injury (SCI) was produced by making a longitudinal incision into the right dorsal horn of the T10-11 segments under equithesin anaesthesia [2]. In separate group of rats SCI1, SCI2 and SCI5 alone or tagged with nanowires were applied topically within 5 to 10 min after SCI and the rats were allowed to survive 5 h. In these animals, behavioral outcome, blood-spinal cord barrier (BSCB) permeability, edema formation and cell injury were examined at 5 h [3]. A focal SCI resulted in severe motor paralysis, widespread disruption of the BSCB to Evans blue albumin (EBA), [131] Iodine or lanthanum tracers and exhibited profound edema formation [3,4]. Cell or tissue destruction was present around the lesion site extending up to T8 and T12 segments [4]. Topical application of normal compounds SCI1, SCI2 or SCI5 in high quantity (10 μg in 20 μl) markedly attenuated behavioral dysfunction that are prominent around 2-3 h after SCI. BSCB disruption, edema formation and nerve cell, glial cell and axonal injuries are less pronounced in drug treated injured animals. These beneficial effects are most marked in animals that received SCI2 treatment compared to SCI1 or SCI5. Interestingly, when these compounds were administered tagged with nanowires, their beneficial effects on functional recovery and spinal cord pathology were further enhanced. Thus, SCI2 tagged with nanowires was able to attenuate functional disturbances up to 5 h after trauma. Spinal cord cell and tissue destruction was minimal in nanowire-tagged SCI2 treated group compared to SCI2 treatment alone. In nanowire-tagged group also the most larked beneficial effects were seen in SCI2 treatment compared to other compounds. Topical administration of nanowires alone did not influence spinal cord pathology or motor function after SCI. Taken together, our results probably for the first time indicate that the drug-delivery and their therapeutic efficacy is enhanced when the compounds are administered with nanowires. The possible mechanisms of nanowire-drug combination induced enhanced neuroprotection is not known and currently being investigated in our laboratory.

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A NEW PARADIGM FOR NEUROPROTECTION AND NEUROPLASTICITY IN TBI – PLEIOTROPIC AND MULTIMODAL DRUGS

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Every lesion in the nervous system triggers in the first minute an endogenous neuroprotective reaction. An endogenous repair process, known as neuroplasticity follows this as a second answer. These two processes are initiated and regulated by

neurotrophic factors.

Neurotrophic factors are produced by different players in the brain tissue and are acting in a pleotropic way against pathological cascades.

The same molecules, due to a complex genetically regulated process, are able to induce immediately after achieving the endogenous neuroprotective effect, neuroplasticity, so, they have also not only pleotropic activity but also multimodal way.

Neuroprotection and neuroplasticity, processes that are apparently independent, with different control, represent in fact two sequences of the same process.

Therefore, they are attractive candidates as therapeutic agents in most important neurological disorders, including TBI and we already have positive clinical data proving this. There is always a crosstalk between neuroprotective mechanisms and brain edema development.

The only available drug nowadays containing active fragments of neurotrophic factors is Cerebrolysin.

CENTRAL NERVOUS SYSTEM EDEMA, NEUROTROPHIC FACTORS AND NEUROPROTECTION

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Central nervous system (CNS) edema is a deleterious complication of impacting and life-threatening neurological diseases, such as brain and spinal cord trauma, stroke or tumor. Based on pathophysiological criteria, CNS edema occurring in neurological diseases is currently classified as cytotoxic, when blood brain barrier (BBB) remains intact and water swell cells, and vasogenic, when fluid accumulates into the extracellular space due to breakdown of BBB. CNS edema causes an increase in the volume of affected tissue and results in a supplemental neuronal death if persists long enough. Therefore, the treatment of CNS edema is of crucial importance and identification of new therapeutic targets for CNS edema is in the current focus of neuroscience research. Current treatment is based on administration of diuretics and corticosteroids, with uncertain results estimated by evidence based methodology. However, in CNS trauma, tumor and stroke numerous studies show a dysregulation of trophic factors transcription. Moreover, specific actions of neurotrophic factors on CNS edema are already documented, such as an exacerbating effect of vascular endothelial growth factor (VEGF) and an alleviating effect of pigment epithelium-derived factor (PEDF). This review focuses on mechanisms of signaling by different types of neurotrophines, on changes in gene expression in both acute and subacute phases of brain and spinal cord stroke, trauma and tumor, and on the therapeutic potential of growth factors and growth factor-like peptides.

NEUROREGENERATION IN SPINAL CORD INJURY : THEORY AND SURGICAL PRACTICE

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The mechanisms of a spinal cord injury must be considered as a multi-step cascade in which the primary lesion [direct mechanical disruption or cotusion of nerve tracts] is progressively extended of the secondary damage. Today only the decompression and administration of high doses of steroids are used.

A future efficient treatment in spinal cord lesions must combine four main approaches:

-replacement of damaged neural tissue of tissue or cell transplantation,

-providing growth-stimulating factors (neurotrophic factors),

-blocking factors which inhibit neural regeneration and

-modulation of inflammatory response following spinal cord injury.

We present our experience of seven patients with spinal cord injuries and the results of the microsurgical resection of the spinal scar and the implant of bone-marrow tissue in the site of the spinal cord lesion.

METHODS

Seven patients with chronic thoracic spinal cord injury and paraplegia underwent a laminectomy to expose the site of the spinal cord injury and partial resection of the medular scar and implant of bone-marrow tissue with a mixture of drugs in the site of spinal cord injury. Ethical approval was obtained from the Ethical Committee of Hospital.

RESULTS

Sensory improvements were noticed to all patients, but no significant motor improvements were observed twelve to eighteen months afterwards.

At one patient with T10-T11 complete spinal cord injury five years earlier the ressult was at two years: complete sensory recovery, return of sensation of passive legs movements, return of bladder control and return of both patellar reflex.

CONCLUSIONS

This surgical procedure consist of microsurgical remove of the spinal cord scar and implanting of the bone-marrow tissue into the spinal cord injury site.The bone-marrow tissue transplantation procedure has no complications. Scar reduction make the post – injury scar more permeable to neuronal axons attempting to regrow through the injury site. These results are promising, but much follow-up work is needed to document long-term benefits.

NEW TRENDS AND PERSPECTIVES IN NEUROSURGERY

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Neurosurgery is an evolving field with very exciting frontiers. I will discuss the use of new energy systems for destroying tumors, local application of chemotherapy, image-guided surgery and robotics and new and exciting developments in the field.

Concerning novel energy systems, laser hyperthermia and focused ultrasound systems may radically change some therapies for tumors especially for focal tumors of low-grade. In malignant tumors we have been able to demonstrate that local application of anti growth factor molecules such as Gleevec and antiangiogenic molecules such as endostatin, PEX and PF4 can be a potent local therapeutic agents. Stem cells can also be important therapeutic agents. Image-guided neurosurgery includes intraoperative imaging and robotics. This develops the concept of the neurosurgeon as local oncologist, which is a potentially important idea for future chemotherapy.

PREDICTIVE OUTCOME FACTORS IN INTRACRANIAL ANEURYSM

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Keywords: intracranian aneurysms, neuroprotection, neuroplasticity, neurorehabilitation subarachnoid hemorrhage, Hunt & Hess Scale, 3D CT Angiography microsurgery, embolization, rebleeding, vasospasm, Nimotop, 3H therapy, Fischer Scale, Guglielmi detachable coils (GDC), Glasgow Outcome Scale (GOS)

BACKGROUND

The intracranial aneurysm (I.A.) represent a prevalence between 0,2-7,9% in the literature data. The variability depends of hospital referral, neuroimaging

findings and autopsy pattern. The pathology of I.A. is a dominant element in neurological and neurosurgical activity, because of multiple preoperatory and management problems. IA affected prepoderently the active age (40 and 60 years old) and the male sex.

The cerebral circulation must be evaluated in totality and aneurysms in particular and the accuracy management is necessary for limitation of important lifethreatring complication (rebleeding and ischemic stroke). Therapeutical solution: Early neurosurgical approach or endovascular aneurysm obliteration. Actually the 3N therapies (Neuroprotection, Neuroplasticity, Neuroregeneration) represent an important steps to improve the global outcome in cerebral vascular aneurysm.

MATERIAL & METHODS

The authors present a study about 528 consecutive operated patients with I.A., operated in first Neurosurgical Department between 1996-2007 – 12 years - (34 children and 494 adults). Most cases (240 cases-45,5%) were between 41 and 50 years old. The predominant sex is male 359 cases (68%) (2,1: 1). The symptoms were dominated by: headache (98%), stiffneck (94%) and focal neurologic deficit (91%). Most patients were Hunt and Hess 2 (194 cases, 36,7%), Hunt and Hess 3 (81 cases, 15,3%) at admition. The associated pathology was: systemic arterial hipertension (396 cases, 75%) and obesity/hypercolesterolemia (180 cases, 34,1%), ischemic cardiopathy (85 cases,16,1%), diabetus melitus (85 cases,16,1%), chronic alcoholism (69 cases,13%), ischemic stroke (63 cases,12%), atrial fibrilation (53 cases, 10%), miscellanea (74 cases, 14%, e.g. anticoagulant therapy).

The main investigations were: CT scan, DS angiography. Actually, the most important and non invasive is 3D CT Angiography.

The common localization of intracranial aneurysms was the anterior communicating artery 178 cases (33,7 %); the other locations were: medium cerebral artery 157 cases (29,7%), posterior comunicating artery 95 cases (18%), internal carotid artery 70 cases, (13,3%), basilar top 18 cases (3,4%) and vertebral artery 10 cases (1,9%). Multiple aneurysm represent in our data 45 cases (8,5%). All cases were operated, as soon as possible after onset of the subarachnoid hemorrhage (SAH) and IA angiography diagnosis. “Early surgery” eliminates the risk of re-bleeding and facilities the treatment of vasospasm which peak is between 6-8 days post SAH. From all complications two are very critical for life and morbidity: aneurysm rebleeding and cerebral ischemia.

The therapeutical operative measures for intraoperatory aneurysm rupture prevention are: mild hyperventilation (PaC02 30-35 mmHg); elevation of the head; deliberate hypotension; temporary clip. The most important intraoperatory aneurysms surgery is the perfect microsurgical approach which realized the perfect aneurysm dissection with all perforates, collaterals and magistral arteries; the clip application on the aneurysm neck is the surgical procedure to cure the vascular malformation (gold standard - aneurysm obliteration). Also as intraoperative neuroprotective measures for vasospasm prevention we mention: local papaverine solution administration and abundant saline water washing.

During postoperative period we noticed the following complications: vasospasm, obstructive hydrocephalus, seizures, cerebral edema, and general complications, in connection with associated pathology.

The following neuroprotective measures for postoperative complications preventions are: 3H therapy (hypertensive therapy, hypervolemic, hemodilution). Nimotop therapy could be used in preoperative period also, for cerebral ischemia prevention. (3-7 ml/h depends on arterial systemic pressure), but 3H therapy could be applied with maximum efficiency only in postoperative period (after aneurysm clipping).

The Glasgow Outcome Scale (GOS) in our data (at 1 months postoperator) shows: good recovery 353 cases (66.8%), moderate disability 125 cases (23.7%), severe disability 26 cases (4.9%), persistent vegetative state 6 cases (1.1%), death 18 cases (3.4%).

Actually, an important number of IA will be treated by endovascular embolization. The Guglielmi detachable coils (GDC) represent an electrolytically detachable platinum coils placed via endovascular techniques. This GDC is a perfect therapeutic solution for vertebro-basilar aneurysm in which the open microsurgical approach is difficult. Our experience in 1st neurosurgical dpt. consist in 33 cases of embolization (1 case, two times embolization). Also in this procedure appears many complication: aneurysm rupture, cerebral ischemia, neurological deficit and consciousness status modification.

CONCLUSIONS

IA represents an important neurological and neurosurgical challenge. Also I.A. by the rupture and complication is the real lifethreatering diseases. Complete vascular exclusion is the treatment of choice by open microsurgical approach or endovascular embolization.

The important measures to avoid rebleeding and cerebral ischemic stroke in intracranial aneurysms are perfect evaluation and early approach, perfect aneurysm dissection and neuroprotective measures (pre, intra and postoperatory). Neuroprotective agents – useful to avoid cerebral ischemic stroke The timing of aneurysm surgery is one of the key of avoidance lifethreatring complication. In our data predictive outcome factors remains patient age, associated pathology, seize and volume of aneurysm, the grade of SAH with or without ventricular invasion (Fischer Scale), time between rupture and hospital ICU admition with all neurovascular facilities.

667 CEREBRAL ANEURYSMS: CHANGES OF TREATMENT BETWEEN 1990 AND 2004

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In the last years coiling of aneurysms gained more importance. However, clipping is still in many cases the treatment of choice. This study shows changes in aneurysm treatment in the last 15 years and compares results of coiling and clipping.

METHODS

Aneurysm treatments (n= 667) between 1990 and 2004 were analyzed. Treatment modalities (clip or coil) were compared in respect of clinical presentation, outcome, aneurysm-localisation, duration of intervention, rebleeding and reperfusion.

RESULTS

In the years from 1990 to 2004 667 aneurysms were treated: 432 were clipped, 235 were coiled. In the first 5 years of this period all aneurysms were operated upon, whereas in the last 5 years only 26% were operated upon. The posterior circulation was the domain of posterior circulation, in the ACoA and ACM localisation surgery had a light dominance. No difference between clipped or coiled aneurysms was found for initial clinical presentation (Hunt and Hess) and outcome (GOS). However, in the last years clipping for patients with H and H 4/5 was dramatically reduced. In 3480 post-surgical patient-years 6 re-ruptures and one re-perfusion of clipped aneurysms occurred, respective in 345 patient-years no re-rupture and 22 reperfusions for coiled aneurysms. The duration of intervention was significantly shorter for coiling than of surgery.

DISCUSSIONS

Coiling developed fast in the last 15 years. However, each individual case should be discussed to find the best therapeutic option. Depending of the situation coiling or clipping could be advantageous. Therefore coiling and clipping should not be regarded as competitive but as complementary. A neurovascular centre should have both therapeutic options available.

SURGICAL MANAGEMENT OF ANEURISMAL SUBARACHNOID HEMORRHAGE IN 308 PATIENTS WITH ANTERIOR CIRCULATION ANEURYSMS

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There is still an on-going debate concerning whether neuroradiologic or open-surgery approaches should be used as "best choice" in the treatment of aneurismal subarachnoid hemorrhage. We designed a retrospective study regarding the indications, the results, and the features of our series of 308 patients who underwent open-surgery for ruptured anterior circulation aneurysms between 1997 and 2008.

The main objective was to determine the value of the surgical treatment and especially that of early surgery.

All cases underwent open surgery, in 96% of the cases definitive clipping was achieved. The results were evaluated using GOS at discharge, comparing these with the clinical findings at admission. In our series of patients with Hunt & Hess grade I and II, 88,4% had good outcome and 7,2% died. The patients with Hunt & Hess grade IV and V underwent early surgery in as many cases as possible with the following results: 63% of the patients survived, from which 34% had good results. The outcome depended on pre-operative clinic state of the patients, age, the localization and morphology of the aneurysm, unruptured associated aneurysms and associated diseases.

All in all open-surgery and especially early open-surgery remains a viable option in the treatment of aneurismal SAH.

OUR EXPERIENCE WITH RUPTURED ANEURYSMS SURGERY IN DIFFICULT FOR COILING CASES

ION POEATA, ZIYAD FAIYAD, M. ROTAR, M. IVANOV, N. DOBRIN, AL. CHIRIAC

Keywords: intracranian aneurysm, clipping, coiling, endovascular, microsurgical

The objective of this study is to analyze the aneurysmal cases difficult for coiling in a consecutive series of 620 ruptured aneurysms clipped. The difficult for coiling cases analyzed were: small aneurysm – preaneurysmal ruptured lesions, ruptured complex aneurysms with arterial branch arising from aneurymal bag, large neck aneurysms.

We retrospectively analyze the aneurysms difficult for coiling. Preop images: CT, angiography (catheterism, CT, MRI), 3-D preoperative planning – virtual surgery, intraoperative recordings, and outcome were analyzed.

Endovascular is a continuously developing technique and new types of coils, materials, and combination of stent and embolization maybe will improve the possibilities of this technique with the above mentioned lesions.

Microsurgical technique, new clips, wrapping materials, and anastomotic possibilities on the other hand are expected also to improve the results with difficult aneurysms.

In this presentation we emphasize video aspects of aneurysms difficult for coiling and our surgical strategies in these cases.

SUPRAORBITAL APPROACH IN SURGICAL TREATMENT OF ANTERIOR CIRCULATION CEREBRAL ANEURYSMS

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BACKGROUND

We report our experience with the minimally invasive supraorbital approach to the aneurysms of ipsilateral anterior cerebral circulation.

METHODS

113 patients were operated in our clinic between 2000 – 2007, with age range from 17 to 74 years, 93 % with acute subarachnoid hemorrhage. Supraorbital keyhole approach was used in last 16 patients with 18 aneurysms: CCoA – 9, ICA – 8, CMA – 1 as well as 9 patients with acute SAH, 7 in the "cold" period. Positive diagnosis was established using clinical and anamnesis data, cerebral CT scan, cerebral angiography and, recently introduced, CT scan angiography with digital substraction.

RESULTS

In all 16 cases surgery was successful. 5 cases with intraoperative rupture were solved by proximal control. All patients were discharged in relatively good condition.

CONCLUSIONS

Implementations and use of new methods of diagnosis of cerebral vascular pathology such as CT scan angiography have lead to better planning and more precise surgical approach of cerebral aneurysms. Development of microsurgical techniques with tendency of minimalization of surgical trauma allow the use of microsurgical supraorbital anatomy for surgical treatment of supratentorial aneurysms in "cold" period and in noncomplicated hemorrhagic period in patients with relatively good condition with good postoperative and cosmetic results.

NEUROENDOVASCULAR STEPS IN IASI MEDICAL CENTER

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The endovascular treatment for cranial and spinal lesions started in Iasi Medical Center with a team composed of both Neurosurgeons and Cardiologists from University of Medicine and Pharmacy "Gr. T. Popa" Iasi, Romania working under the coordination of Professor Patrick Courteoux (Neuroradiologist from CHU-Caen, France)wich have realized the first steps in November 2004. They began with implementing a stent for the exclusion of an aneurysm of the basilar trunk, a partial embolisation of a Spetzer V parietal left AVM and an embolisation of an important parietal left meningioma (en plaque).

We propose to present our experience and some intreresting cases solved in our Clinic.

MULTIPLE CEREBRAL ANEURYSMS LOCALIZED IN FRONT DIVISION OF WILLIS 'S CIRCLE: THE SURGICAL TREATMENT OF THE 103 PATIENTS IN ACUTE PERIOD OF SUBARACHNOID HEMORRHAGE

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Were analyzed the results of the surgical treatment of the 103 patients with 222 aneurysms and SAH from January 1992 till December 2007 in our hospital. 88 patients had two aneurysms, 14 patients - 3 and 1 patient - 4 aneurysms. The initial clinical condition was: I-8% of patients; II-54%; III-33,1%; IV-4% and V-0,9%.

In all cases was used unilateral pterional approach and, if it is possible, single-stage clipping of all MA. For correct location of the ruptured aneurysm and choose the side of the approach was successfully used combined analysis of results of CT, EEG and CA.

97% of aneurysms were clipped, 3% - were wrapped or not clipped.

RESULTS AND DISCUSSION

Patients with MA, localized in front division of Willis's circle, were presented in 11% of all patients with intracranial aneurysm. The results of the surgical treatment were: I-II - 71,1% of patients; III-7%; IV-0,9% and mortality - 21%. The severity condition of patients and the intensity of cerebral ischemia before the surgical treatment correlated with poor outcome after the surgical treatment.

CONCLUSION

The surgical treatment of patients with MA in acute period of SAH is the best management, because only the surgical treatment gives the good chance for fully clipping of aneurysms, good possibility to detect and to stop intraoperative aneurysmal bleeding and evacuate clots from basal cisterns for the prophylaxis of vasospasm. Before the surgical treatment is very important to detect all factors of risk: severity condition of patients and the intensity of cerebral ischemia

SURGICAL TREATMENT OF BASILAR ARTERY APEX ANEURYSMS: REVIEW OF A 26-YEAR EXPERIENCE

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Keywords: basilar aneurysms, subarachnoid hemorrhage, pterional approach, subtemporal approach

BACKGROUND

The surgical treatment of basilar artery apex aneurysms (BAA) represents a technical challenge for the practicing neurosurgeon. Many of these aneurysms are currently treated by endovascular techniques, but complex BAA frequently fail endovascular treatment. We report our experience and try to provide information regarding the expected clinical outcomes and sources of morbidity in surgical management of basilar apex aneurysms.

METHOD

We conducted a retrospective study of 119 patients with BAA surgically treated in our institution in the last 26 years. The preoperative clinical presentation, computed tomography (CT) and angiographic characteristics of the patients and the surgical approach were analysed in relation with the clinical outcome. Clinical grading using the modified Glasgow Outcome Scale (GOS) was conducted at the time of hospital discharge and for 85% of the surviving patients at 6 months after surgery.

RESULTS

The patients with BAA represented 4,75% of the patients with cerebral aneurysms operated in this period. Only 80,5% of cases presented with subarachnoid hemorrhage. In 5 patients (4,20%) the angiography revealed a giant aneurysm and in 17 patients (14,28%) an aneurysm of large size (1,75-2,5 cm). In 73% of the cases we used a pterional trans-sylvian approach and in 27% a subtemporal approach. The temporary clipping was rarely used. Good outcomes (mGOS scores of I or II) were achieved in 78,15% of the patients (93 cases) at the time of discharge and in 88,23% of the patients (105 cases) at 6 months after surgery. Seven patients (5,88%) had a poor outcome and 7 patients died (5,88%). There was no incidence of postoperative subarachnoid hemorrhage. Residual aneurysm was revealed by postoperative angiography in 3,3% of the cases. Factors found to be statistically linked to poor outcome included poor admission status (Hunt and Hess grades IV and V), symptoms attributable to brain stem compression, patient age older than 65 years, computed tomographic demonstration of thick basal cistern clot and aneurysm size greater than 20 mm.

CONCLUSION

The data presented suggest that, in "experienced hands", surgical clipping should be still considered an important component of a multimodality approach to the treatment of patients with basilar apex aneurysms.

ENDOSCOPIC THIRD VENTRICULOSTOMY (ETV) IN COMMUNICATING HYDROCEPHALUS

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ETV is safe, restores physiological CSF circulation, has fewer complications in the long term run, and is cheaper than ventriculo-peritoneal shunting. Therefore hydrocephalus types suitable for ETV should be detected to avoid unnecessary shunts. ETV is generally accepted for obstructive hydrocephalus especially for aqueductal stenosis, whereas communicating hydrocephalus (CommH) is considered as contraindication. However, we describe a subtype of CommH with free communication between the ventricles and subarachnoid space but with infratentorial intracisternal obstructions - suitable for ETV.

METHODS

Infratentorial Intracisternal Obstructive Hydrocephalus (InfinOH) shows in MRI a downward bulged floor of the third ventricle and a discrepancy of sizes between the great and prepontine cistern. We have detected 26 hydrocephalic patients with these MRI patterns and analyzed clinical outcome after ETV as well as shunt independence. Patients with follow-up of less than 3 months were excluded; follow-up was terminated, when shunting was necessary. In 3 cases intrathecal Gadolineum was administered to demonstrate directly the intracisternal obstruction.

RESULTS

We could analyze 22 patients with medium follow up of 17 months (0-126 months). Symptoms were consistent with chronic hydrocephalus. Ten cases were classified as idiopathic normal pressure hydrocephalus due to symptoms and history. MRIs with inthecal Gadolineum showed a retarded passage into the supratentorial subarachnoid space. Fourteen of 22 patients (64%) showed a clinical improvement after ETV and remained shunt-free.

DISCUSSION

The success-rate of 64% supports the theory of InfInOH. Further MRI and pathophysiological studies should help in detecting this hydrocephalus subtype. In consequence patients´ selection for ETV should be improved.

THE NEED OF A PROGRAMMABLE GRAVITATIONAL VALVE FOR HYDROCEPHALUS TREATMENT

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Hydrocephalus shunting may be complicated by over- or underdrainage. Gravitational driven shunt assistants (SA) could reduce but by far not exclude overdrainage. An analysis is done to improve the choice of valve and gravity device settings.

METHODS

ICP in patients with ventriculo-peritoneal shunts can be calculated with the following equation: ICP = valve opening pressure – hydrostatic pressure difference (HPD) + setting of SA + intra-abdominal pressure (IAP). For horizontal and vertical position different valve and gravity device settings were calculated to reach physiological ICP (in horizontal position around 5-10 cmH2O and in vertical position around 0 to- -5 cmH2O).

RESULTS

To reach physiological ICP in horizontal and vertical position a differential valve is not necessary, a solely

gravity device is sufficient: Example: patient, 180cm height, 80 kg (HDP: 40 cm; est. IAP: 5 cmH20): With a solely SA of 30 cmH2O, ICP results for vertical position in -5cmH2O and for horizontal position in 5 cmH2O. However, HDP changes in growing (pediatric) patients and IAP changes with weight, constipation, gravidity and in different body positions in a manner difficult to predict. These variations might result in unacceptable ICPs and may cause over- or underdrainage.

DISCUSSION

Differential valves are not necessary for hydrocephalus shunting if gravity assisted devices like a shunt assistant is present. To cope with the variables and the unpredictable IAP, programmable gravity devices are necessary to avoid improper CSF drainage. The newly designed programmable shunt assistant "proSA" has to show in clinical trials how realistic these advantages are.

LATE COMPLICATIONS OF MYELOMENINGOCELE (MMC)

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"The least afflicted children are the most vulnerable, as they have more function which may be further impaired." Fred Epstein

Nowadays the refinements of appropriate and multidisciplinary management of MMC lead to a longer lasting life expectancy. That is why it is of real interest to focus on the factors affecting both the late functional and vital outcomes and the means to prevent them.

We have pointed out 5 groups of factors:

Hydrocephalus: 25% amongst the newborns are presenting with hydrocephalus. Amongst the remaining: 75% will develop a ventricle enlargement and 80-90% will require a shunt placement.

There are multiple causes of late neurological deteriorations: ACII malformation, Hydromyelia, Secondary tethering, Associated spinal cord abnormalities, Lumbar canal stenosis.

They are often intermingled and the usual problem is to deal with the pathological conditions consistent with the symptoms.

The general outcome is affected by specific complications: epilepsy: 25%, metabolic syndrome: 55% in teenagers, scoliosis: affects many patients amongst them 2.5% require surgery

The prevalence of latex sensitisation and allergy in MMC population goes up to 29-72% and clinical allergy to15% (anaphylactic reaction).

In the literature the mortality rate depends upon the authors: 2,4% → 24%. The main causes are: shunt malfunction/infection, renal scarring and urinary sepsis, bulbar failure

To conclude we emphasize the general conditions affecting the physical function and occupation, the cognitive and psychological function: on the one hand the level of the MMC (below or above L1), on the other hand the number of shunt revisions.

SUPINE POSITION FOR POSTERIOR CRANIAL FOSSA SURGERY: A FEASIBILITY STUDY

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We report our results and experience of posterior fossa surgery performed in supine position as an alternative to semi-sitting or prone position to prevent hemodynamically relevant air embolism.

METHODS

Sixty patients were operated upon posterior cranial fossa lesions in supine position between 2005 and 2007. The head was rotated 40-60° to the opposite side. Surgery was performed for 15 trigeminal neuralgias, 11 acoustic neuromas, 25 diverse CPA-tumours and 9 cerebellar hematomas. Five neurosurgeons skilled with semi-sitting and prone

position performed the surgeries in supine position and reported their experience, pros and cons.

RESULTS

In all cases supine position offered good access to the lesion. No permanent morbidity or mortality happened related to the supine position. There is no need for preoperative transesophageal echocardiography examination (TEE) and for intraoperative air embolism monitoring, simplifying the patients preparation for surgery. Advantages reported are: less retraction due to gravity promoted cerebellar descent; gravity promoted drainage of blood and cerebrospinal fluid like in semi-sitting position; faster patient's positioning than in semi-sitting or prone position; no hemo-dynamically relevant arterial blood pressure decrease and heart rate increase related to body/head elevation; less swelling compared to prone position. Disadvantages reported: less ergonomically situation of the surgeon compared to prone position; no access to cranio-cervical junction and medially located posterior fossa lesions, and limitations due to rigid necks and high shoulders.

CONCLUSIONS

Supine position for surgery of posterior cranial fossa lesions is in most cases good feasible. It is fast in patient's positioning and combines the advantages of the semi-sitting and prone position, reducing unanimously the disadvantages, so it is in well indicated cases superior to the semi-sitting or prone position.

DEEP BRAIN MICROPOTENTIAL RECORDINGS IN PARKINSON DISEASE SURGERY

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INTRODUCTION

Implantation of subthalamic nucleus (STN) deep brain stimulator (DBS) electrodes is a recognized and effective method for Parkinsonian patients. Also it has been proved that microelectode brain activities recording and analysis (MER) is beneficial, it remains unclear at what extent it improve the clinical efficacy.

METHOD

A total of ten patients with Parkinson disease were implanted in the last 4 year. All implantations were based on MR images fused in different environments. MER were performed in all, initially by Leadpoint and latter by Guideline FHS. Direct target calculation, Framelink coordinates and MER were employed.

MER defined the STN boundaries along one or more parallel tracks. Micro and macrostimulation were used for final implantation decision.

RESULTS

Since the microelectrods inbetween distance is of 1 mm, we encountered a difference of less of 1 mm when all above mentioned methods were used. All patients presented a clinical improvement after surgery.

DISCUSSIONS

The maximum available number of track is 5. This is an invasive alternative. We used maximum 4 tracks in only one case and 2 or 3 in most cases. Based on symmetry, there were used only one track for the opposite side electrode implantation in most cases. The final placement of the stimulation electrode decision is still under debate in literature. There are minor adjustments in electrodes trajectory which are analyzed.

CONCLUSION

MER is optional, but its use can offer more accuracy for DBS implantation technique.

ENDOSCOPICAL TREATMENT OF PINEAL REGION TUMORS

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OBJECTIVE

Tumors of the pineal region represent a diverse collection of tumors with a variety of natural histories. The authors evaluate their results in the management of patients with tumors in the pineal region

METHODS

This is a retrospective clinical evaluation of 14 patients with primary tumors of the pineal region treated by microsurgery and endoscopy. There were 5 pineocytoma, 4 pineoblastomas, 3 low-grade gliomas, one germinoma and one teratoma. There were 8 male and 6 female patients. Their median age was 15.5 years (range 3-49 years). In 1 case the endoscopic procedure represented the only surgical treatment (with total removal of a pineocytoma). In 13 cases, microsurgical removal of the lesions and/or ETV or ventriculo-peritoneal shunts placement were performed for the management of hydrocephalus.

RESULTS

All neoplasms were treated surgically with good results. The ETVC was successfully performed without complication in 5 patients and a ventriculoperitoneal shunt was done in four. A total tumor removal was achieved in 9 operations, subtotal in 4 and partial in 1.

CONCLUSIONS

Early surgical resection combined with ETV or diversion of cerebrospinal fluid is effective in the treatment of pineal lesions. The endoscopic management of patients with pineal region tumors affords a minimally invasive way to obtain resolution of obstructive hydrocephalus by endoscopic third ventriculostomy (ETV and tissue diagnosis) and sometimes can be an only surgical treatment. When a direct microsurgical approach is indicated, the choice among the surgical approaches depends on the size and the location of the lesion in the pineal area and its relation to the ventricular system.

INTRAOPERATIVE THERMOGRAPHY IN PATIENTS WITH MALIGNANT BRAIN TUMOURS - FIRST RESULTS OF AN ONGOING STUDY

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OBJECTIVE

The current study was designed to find out whether differences in brain surface temperature may serve as a useful adjunct to current methods of neuronavigation.

METHODS

In 17 patients (age 30 - 82 years) with various supratentorial malignancies (8 glioblastomas, 8 metastases, 1 lymphoma) surface temperatures of the tumour itself as well as of the surrounding brain were studied by means of intraoperative thermography (ThermaCAM B20, FLIR Systems, Frankfurt).

RESULTS

Differencies in mean surface temperature (up to -5.1 C) were detected in 16 of the 17 patients studied. In 11 patients tumour temperatures were lower (range 24.2 - 31.7 C; mean 28,4 C), in 5 patients higher (range 28.9 - 35.1 C; mean 32.3 C) as compared to healthy surrounding brain tissue. While most metastases had a lower temperature as compared to the surrounding tissue, glioblastomas showed an equal distribution of "hot" and "cold" tumours. Temperature within the individual tumour also varied remarkably. The usual pattern observed in "cold" tumours was that of the lowest temperature in the tumour center whereas in "hot" tumours the center had the highest temperature.

CONCLUSIONS

From the first results of our 17 patients in this ongoing study we can conclude that remarkable temperature differences exist when comparing intracranial malignancies with normal brain tissue. Further studies may show whether these differencies can be utilized as an intraoperative adjunct to conventional neuronavigation.

Acknowledgement: Parts of this study were supported by the Else Kröner-Fresenius-Stiftung.

REGIONAL DISTRIBUTION OF BRAIN SURFACE TEMPERATURE OF HEALTHY BRAIN TISSUE IN PATIENTS WITH BRAIN TUMOURS - METHODS OF MEASUREMENT AND FIRST RESULTS

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OBJECTIVE

The present study was designed to determine brain surface temperature in "normal" brains in order to get reference values when applying intraoperative thermography to various pathologies with the long-distance aim to integrate thermography into cranial navigation.

METHODS

In 25 patients with various supratentorial malignancies brain surface temperatures in a distance of at least 2 cm from the tumour was measured by means of intraoperative thermography. A conventional thermograpic camera (ThermaCAM B20, FLIR Systems, Frankfurt) with an accuracy of 0.1 K and a resolution of 540 x 480 pixels was used for this purpose. Room temperature and body core temperature was parallely determined in this ongoing study.

RESULTS

Under general anaesthesia body core temperatures of the patients were remained quite constant (35.7 +/- 0.61 C). Surprisingly a very heterogenous inter- and intraindividual distribution of brain surface temperatures was observed. Minimal temperatures were 28.7 +/- 4.8 C, maximal temperatures 32.5 +/- 3.7 C. Regional differences were as high as 7.8 C in the individual patient.

CONCLUSIONS

Brain surface temperatures vary extremely in peritumoral brain tissue and show an inhomogenous distribution. The reason for this phenomenon up to now cannot be explained. Regional inhomogenities in blood flow may be responsible for this phenomenon. Further studies in other pathologies (decompressive craniectomy, aneurysm surgery, basal meningeomas) are on the way to create hypotheses which might explain the results obtained. Mayxbe additional parameters (local CBF, local PO2) are needed to clarify the points mentioned above.

Acknowledgement: Parts of this study were supported by the Else Kröner-Fresenius-Stiftung.

FUNCTIONAL MAGNETIC RESONANCE IMAGING (FMRI), DIFFUSION TENSOR IMAGING (DTI) AND TRACTOGRAPHY IN NEUROSURGERY

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PURPOSE

Functional Magnetic Resonance Imaging (fMRI) and Diffusion Tensor Imaging (DTI) are relatively new tools that can facilitate a successful neurosurgery planning in numerous pathological CNS' cases. fMRI can help in: determining the dominant hemisphere for

the surgery of epilepsy; pre-surgical control by determining the spatial correlation of centers responsible for speech, motion, vision etc with respect to the lesion; surgical planning for maximizing the tumor tissue removal, while minimizing the post-surgical functional deficit; the plasticity in ischemics, e.t.c. DTI can give a more detailed picture of pathological neural deficiencies by providing qualitatively information, such as Fractional Anisotropy, as well as quantitatively such as Tractography.

METHODS AND MATERIALS

In our prospective study, 24 patients with various types of pathologies, such as epilepsy, gliomas, etc. were examined with fMRI and DTI. Anatomical and functional images were acquired at 1.5 Tesla Signa HDx system (GE, Milwaukee, USA). fMRI data was processed off-line with Post-Acquisition (PA) Brainwave (GE) software, while DTI was processed with Functool (GE).

RESULTS

Motor and speech centers were determined and together with MR Tractography findings were fused on high resolution 3D images in all patients. Multiple paradigms ensured the reproducibility of the fMRI results. Various cases-examples (shown and discussed here) demonstrate the capabilities of fMRI and DTI.

CONCLUSION

The techniques of fMRI and DTI can picture the functioning of brain as well as its neural fibers, facilitating like this the neurosurgical pre-planning.

MODERN IMAGING TECHNOLOGIES FOR INTRACRANIAL LESIONS

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New development in imaging technologies brings for neurosurgeons important preoperative and postoperative prospects for intracranial lesions evaluation.The new MRI techniques we currently use in Neurosurgical Clinic, County Hospital Timisoara are: DTI (diffusion tensor imaging), cerebral spectroscopy, SWI (susceptibility weighted imaging).

DTI (diffusion tensor imaging)- MRI technique-application is useful for localising white mater tracts in relation with intracranial lesions,

MRI SPECTROSCOPY – can evaluate intra-lesional components (metabolites). Offers the opportunity for establishing differential diagnosis (ischemic, inflammatory, tumoral). In tumor pathology it is used to establish tumoral grading.

SWI (susceptibility weighted imaging)- a very new sequence in MRI which evaluates magnetic properties of blood, iron and other structures. Now it is used for diffuse axonal injuries, micro bleeds, angiogenesis in tumors, venous angiomas (slow flow vessels).

Acquisitions are made with 1,5 T MRI.

We have used in our clinic 16 preoperative spectroscopies, 15 pre- and postoperative patients having DTI, 45 cases using SWI: 20 for venous malformation, 10 for trauma – axonal injuries, 10 cases in tumors and arteriovenous malformation pathology.

CONTROVERSIS IN CRANIOPHARINGIOMAS EXPERIENCE OF 137 CASES CHILDREN VS ADULTS (GKS INCLUDED)

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Keywords: craniopharyngioma (CPH), MRI, children, adamantinoma, CPH Scale, recurrences, regrowth, Gamma Kinfe Surgery (GKS)

OBJECTIVES

Craniopharyngiomas (CPH) are benign slow-growing intra-cranial calcified tumors, preponderant in children. CPH expand in the pituitary stalk axis, from the sphenoid body to the third ventricle. MRI improves the anatomical location, the tumor diagnosis and the

operative strategy. Microsurgery represents the main treatment option in spite of major difficulties. The goal of this study is to analyze the outcome of a series of 102 CPH cases of pediatric population and 35 CPH in adults, treated surgically.

METHODS

Authors performed a retrospective analysis of 102 consecutive children (0 – 16 year old) and 35 adults with CPH diagnosed and operated at the "Bagdasar-Arseni" Clinical Hospital, Bucharest, during a period of 17 years (1990 – 2006).

In this cohort of children, males were slowly preponderant (54 boys and 48 girls), affecting predominantly the age group 7 – 10 y.o. (41 cases – 40.2%). Clinical features consisted of visual impairment (71 cases - 69.6%), endocrine dysfunction (83 cases - 81.5%) and increased ICP syndrome (68 cases - 66.6%). Visual and endocrine symptoms prevailed. Headache, was frequently encountered - 88 cases (86.3%). Hydrocephalus was present preoperatively in 26 cases (25.5%) and was dealt with VP shunt before definitive tumor therapy in 13 cases (12.7%). The essential neuroimaging findings were CT scan and actually MRI. No DSA investigation was carried out routinely.

In adults (preponderently 31-40 y.o., 21 cases) main clinical picture was characterized by headache 31 cases (88.5%), visual impairment 28 cases (80%), and endocrine dysfunction 15 cases (42.8%). None of them received radiotherapy and/or stereotactic radiosurgery, before surgical approach. All the cases underwent thorough endocrinological and neurosurgical investigations, pre- and postoperatively.

PATHOLOGY

The adamantinous type was preponderant in children (93 cases-91.3%) and papillary type in adults (31 cases-88.5%). All the cases were followed up during a period going from 6 months to 15 years.

In our series, in children, the most frequent location of CPH was the suprasellar retrochiasmatic region (75 cases – 73.5%). Pathologically, combined forms (cystic forms with calcifications) are prevalent: 55 cases (53.9%). A personal craniopharyngiomas grading scale was presented.

In children, surgical approach was adapted to the tumor location: bilateral subfrontal (33 cases–32.4%), unilateral frontal (22 cases-21.6%), and pterional (22 cases–21.6%), followed by midline interhemispheric (17 cases–16.6%), transcallosal (3 cases–2.9%) and combined (5 cases-4.9%). Actually, the fronto-lateral and pterional approach were preponderant surgical strategy both in children and adults.

In adults, surgical approach was: subfrontal (20 cases-57.1%, subfrontal bilateral 12 cases, 34,3%, unilateral frontal 8 cases, 22,8%), interhemispheric (2 cases-6.3%), pterional (11 cases-31.2%), transcallosal 0 cases, transsphenoidal 2 cases (6.3%), combined approaches 0 cases.

RESULTS

In children: the total removal of the CPH was the goal of the surgery, but this was achieved in only 55 cases (54.3%), because of the risk of functional impairment or possible operative mortality. In 9 cases (8.7%) we performed near-total resection, in 34 cases (33.7%) partial resection, and 3 cases (3.3%) were biopsies. We performed biopsy with cyst evacuation only on giant, extremely compressive forms, in which the tumor collapse was accompanied by cardiac bradycardia. Hydrocephalus was present in 26 cases (25.5%). No intraoperative death occurred. In the first month, there were 5 deaths (4.9 %), due to hypothalamic injury, in each case total removal having been attempted.

The real recurrences occurred in 17 cases from 55 cases of total removal (30%); tumor regrowth was noticed in 35 cases (76.2%) from a total of 46 cases with remnant tumor (near-total, partial and biopsies).

In adults series the total removal was achieved in 24 cases (68.5%), near total removal in 4 cases (11.4%), partial in 7 cases (20 %), and no biopsy. No perioperative death in 35 cases CPH, operated in adults. Recurrences and regrowth occurred in 4 cases (11,4%).

Gamma Kinfe Surgery (GKS) was performed in 6 cases in children and 7 cases in adults, all with reccurences, but the results remain disputable because the tumoral chist pression asked a surgical approach.

Neuropsychological assessments revealed no altered IQ at individual level. The Intracranial Hypertension (ICP) and the tumor localization determine attention deficits. Extended tumor localization determines the deficient mental control and the apathy. The recidivated tumor determines psychological dysfunction: attention, memory and the orientation. The depression is dependent by age old of the patients and the QOL is dependent by the tumor localization. Psychosocial reinsertion is affected by memory dysfunction, medium moodiness and the forceless Ego. A good rehabilitation recorded in 50%patients who underwent counseling before neurosurgical interventions.

CONCLUSIONS

Surgical treatment remains the main option, but the important number of complications, regrowths and recurrences prove the necessity of a multidisciplinary approach: microsurgery, radiosurgery and endocrinological treatment. The adamantinomas type was very important in reccurences and regrowths of CPH. Also, the authors present a CPH scale which facilitates the perfect location, surgical approach and outcome in this kind of tumor.

INVASIVE PITUITARY ADENOMA

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Pituitary adenomas are the third most common intracranial tumor after meningiomas and gliomas. Some adenomas are typical but others may be invasive, aggressive, premetastatic or carcinomatous. Invasive adenomas can infiltrate bone, dura, nasal sinuses, cranial nerves and venous sinuses. The goal of surgery in the invasive nonsecretory adenomas is gross total resection, followed by radiotherapy, radiosurgery or conservative follow up. In the inasive seretory group, surgery is followed by medical treatment, radiotherapy or radiosurgery.

We are presenting our experience with giant invasive pituitary adenoma in the period between 1990 – 2006. 42 patients were encountered: 29 males and 13 females. Age of patients ranged from 16 – 68 years with mean age of 36.7 years. Main presentation was visual failure and diabetus insipidus.

Twenty three patients were non secreting adenomas, 12 prolactin secreting, 3 ACTH and 3 GH secreting. 40 patients needed transcranial and two patients needed trannasal surgical excision. Indication of surgery in nonfunctioning adenoma was neurosurgical deterioration. In the secretory group indication was deterioration of neurological condition in spite of medical treatment. Transcranial surgery was needed where invasive adenoma extended to posterior, middle or anterior fossa. One preferred surgical approach by us is transbasal subfrontal, among other approaches. The aim of surgery was gross total resection whenever possible. Postoperative adjuvant therapy was needed for all patients: radiotherapy in 28 patients, Gamma radiosurgery in 6 patients and drug therapy in 6 patients. The dose in Gamma Knife varying between 14 – 22 gray. Follow up in our patients ranged from 20 – 154 months with mean follow up period of 58.2 months. Mortality in this series occurred in 2 patients: one patient died of meningitis after major CSF leak and one died of pulmonary embolism. No carcinomatous change was seen in any of our patients.

We believe that surgical cure is not possible for all invasive secretory and nonsecretory adenomas. Invasiveness is an issue decided by radiological, histological, and operative findings. Most invasive adenomas are giant ones.

ENDOSCOPIC AND ENDOSCOPIC ASSISTED TRANSSPHENOIDAL SURGERY FOR PITUITARY ADENOMAS

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Endoscopes have been used for transsphenoidal surgery since more than 15 years and become popular meanwhile. Because of the confined area and the potential risks for this surgery special training to handle the endoscopes is mandatory. The question arose whether the introduction of endoscopic surgery should be on step wise or not. We followed a 2-step development from microsurgery to endoscopic assisted microsurgery and from endoscopic assisted surgery to pure endoscopic surgery (as step 2) to overcome these problems.

We describe the differences of these techniques their goals and compare the results for both techniques.

We analysed 127 endoscopic assisted operations and 73 pure endoscopic procedures:

In both series we had no mortality, no cerebral complication nor optic nerve lesion.

The rate of CSF leaks requiring reoperations were more often in the endoscopic assisted series (6 % vs 2,7 % during endoscopic surgery). In 7 % of endoscopic assisted and 8 % in pure endoscopically operated cases we had postoperative Diabetes insipitus.

The cure rate in the combined series was 70% (no tumor in MRI or cure from hypersecretion).

In conclusion: Endoscopic surgery of the sella and beyond the sella seems to be a promising and challenging future for this technique. The results are comparable and promising, but pure endoscopic surgery, although it seems to be more demanding to begin with, may offer more possibilities.

HOW COULD WE ACHIEVE A DEFINITIVE CURE IN ACROMEGALY?

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In acromegaly, disease caused by hypersecretion of growth hormone (GH) due to a pituitary adenoma, stringent criterias to define the biochemical remisiion of acromegaly were introduced. Transsphenoidal surgery is considered the primary therapeutic option, medical therapy, represented by somatostatin analogs has usually an adjuvant role and because of the high number of side effects, conventional fractioned radiothrapy tends to be replaced by Gamma knife radiosurgery. Our study presents the two years experience (2006-2008) of the 3rd Neurosurgical Department, Emergency Hospital "Bagdasar-Arseni" on GH-secreting pituitary adenomas with a special aim: to analyse the optimal therapeutic interval to apply medical treatment (somatostatine agonists) as adjuvant therapy to surgery and radiosurgery, based on the conclusions of the most recent analysis of long-term results regarding tumor shrinkage and hormonal effects of gamma knife radiosurgery, that suggested a significant reduction or normalization of hormone secretion obtained only after more than 36 months.

SUPRASELLAR MENINGIOMAS, PERSONAL EXPERIENCE IN 37 CASES

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INTRODUCTION

Suprasellar meningiomas arising from dura mater around tuberculum sellae or diaphragma sellae are rare

tumors constituting 2-6% of all intracranial meningiomas. Tumors of these regions can cause insidious visual loss unilaterally or bilaterally. They are challenging lesions because of their close proximity to major neurovascular structures.

METHODS

We are presenting our experience with 37 suprasellar meningiomas (30 tuberculum sellae and 7 diaphragma sellae) in the period between 1990 – 2005. There were 27 females with age from 35 – 70 years (mean age of 51 years) and 10 males ranging in age between 29 – 51 years (mean age of 43 years). Thirty four patients were operated upon for the first time while 3 patients had previous surgery at other institutions.

RESULTS

The presenting symptoms were mostly visual deterioration (100%). The most common visual fields encountered were unilateral temporal hemianopia in 14/37 patients, and bitemporal hemianopia in 9/37 patients. Other presenting symptoms includes bitemporal headache, memory changes, epilepsy and endocrine dysfunction.

Surgical approaches utilized were interhemispheric transbasal in 32 patients, unilateral subfrontal in 3 patients and unilateral pterional in 2 patients. We achieved gross total resection in 35 patients. Subtotal excision was achieved in 2 patients.

Histopathological studies showed transitional and meningothelial types in most cases. Optic canal was involved in 6 patients where deroofing of optic canal was needed. Anterior clindectomy was needed in 2 patients only.

Follow up in our patients ranged from 24-149 months (mean follow up 78 months). Three patients only were lost for follow up. Results showed improved visual outcome in 20/34, patients unchanged vision in 12/34 and worsening of vision in 2/34 patients. Other morbidity included anosmia, CSF leak, and temporary diabetus insipidus. There was no mortality encountered in this series. Recurrence occurred in one patient 4 years after his initial surgery.

CONCLUSION

Tuberculum sellae and diaphragma sellae meningiomas are rare and challenging lesions. These tumors could and should be totally resected. Results of surgical excision depend on microsurgical techniques to preserve blood supply to visual apparatus and minimize surgical insult by delicate handling. This advantage is offered by the interhemispheric transbasal approach which puts the surgeon in total control of neurovascular structures and gives him/her the chance of achieving gross total resection with minimal complications.

SELLAR AND PARASELLAR LESIONS – 30 MONTHS RETROSPECTIVE STUDY OF A C ONSECUTIVE SERIES OF 40 CASES WITH MICROSURGICAL PTERIONAL RESECTION IN THE ERA OF GAMMA-KNIFE

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Keywords: sellar, parasellar, pterional, microsurgery

OBJECTIVE

To analyze the last 30 months series of pterional tumoral resection for sellar and parasellar lesions cases.

METHODS

A series of 40 consecutive cases of sellar and parasellar lesions operated during January 1st 2006 – June 31st 2008 is analyzed. We used the following protocol: MRI diagnosis, preoperative prednisolone, 25 mg per day, pterional microsurgical approach, prechiasmatic and carotido-optic windows tumoral exposure, supplementary exposure in particular cases, total resection when possible, partial resection with ulterior gamma-knife when pre- or intraoperative surgical dangers were assessed. Microadenomas are not subject of this study being resected trans-sphenoidally.

RESULTS

The histology consisted of: pituitary adenomas in 24 cases, craniopharyngiomas, 7 cases, meningiomas, 6 cases, metastasis, 2 cases, trigeminal schwannoma, 1 case. Sex distribution: 22 males and 18 females with a male to female ratio of 6:1 for craniopharyngiomas, and 6:5 for adenomas. Complete surgical removal, MRI documented was obtained in 24 cases. In 7 cases small residuals were stable with MRI follow-up and no additional treatment was recommended until now. The remaining 9 cases with residual tumor were sent for gamma-knife treatment.

The complications documented in this series were: 2 postoperative deaths, one by diencephalic complications and one by trombembolism, 2 meningitis cases cured under antibiotics but with subsequent hydrocephalus requiring DVP in one case, one surgical recurrence, early postoperative diabetes insipidus, in 9 cases, but only 2 remained hormonal substitution dependent. We detail some particular cases in this series: 2 pituitary apoplexy and one case with pituitary adenoma associated with cavernous sinus meningioma.

CONCLUSION

Big or infiltrating parasellar tumors remain difficult surgical cases. The policy of a more conservative microsurgical removal leaving dangerous parts of the tumor for radiotherapy or simply for imagistic follow-up seems to improve the results comparing with previous series.

CERVICAL MYELOPATHY – A 5 YEARS RETROSPECTIVE STUDY

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Surgical treatment of cervical myelopathy is still raising discussions and postoperative results seem not to be constantly positive.

The paper analyses all the patients with cervical myelopathy admitted in the Spinal Surgery Department of the Emergency Hospital "Bagdasar-Arseni" during the last 5 years. The study is retrospective and refers to 129 patients with symptomatic cervical myelopathy operated on via anterior (diskectomy and/or corpectomy) or/and posterior approaches (laminectomy).

The mean age of the patients was 50,1 years with limits between 23 and 79 years. The minimal follow-up was 2 months and the maximal 4 years. The higher incidence was noted at the age group of 40 – 49 years. The cord compression was most frequent at C5-C6 level – 69 patients and C4-C5 level – 47 patients.

The study defines the diagnosis criteria for cervical myelopathy, includes considerations on the surgical technique to be adopted and analyses the treatment results.

ANTERIOR AND/OR POSTERIOR APPROACH FOR CERVICAL MYELOPATHY

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Cervical spondylosis affects the vertebral bodies and intervertebral disks of the neck as well as the contents of the spinal canal (nerve roots and/or spinal cord).

Symptoms of cervical spondylosis may appear in persons as young as 30 years but are found most commonly in individuals aged 40-60 years and radiologic spondylotic changes increase with patient age.

Cervical spondylotic myelopathy is the most common cause of nontraumatic paraparesis and tetraparesis.

1. Indications for surgery include the following: progressive neurologic deficits ; documented compression of the cervical nerve root and/or spinal cord ; intractable pain.

2. The aims of surgery are to relieve pain and

neuronal structured compression, as well as, in select cases, to achieve stabilization.

3. Approaches for surgery are anterior or posterior.

a. Anterior approaches include the following: diskectomy without bone graft; diskectomy with bone graft; cervical instrumentation

b. Posterior approaches include the following: decompressive laminectomy and foraminotomy;

hemilaminectomy ; laminoplasty

The results of the surgical treatment of the 70 operated patients for cervical spondylotic myelopathy were analyzed.

The posterior approach is accepted as a standard decompression procedure in patients who have more than 3 segments of stenotic changes; fixed local or global kyphosis is a relative contraindication.

Laminoplasty and its variants preserve the lamina to avoid excessive scar formation and to reduce the incidence of postlaminectomy kyphosis and for the treatment of multilevel CSM.

Laminectomy combined with lateral mass fusion may yield excellent results without progression to spinal instability or kyphosis.

The anterior approach is indicated for CSM when identifiable anterior compression or kyphotic deformity is present. Myelopathy due to osteophytes confined to 1-2 levels is treated using ACD and fusion with removal of the osteophytes. In severe cases, extensive decompression is performed using multilevel vertebrectomies (corpectomy) and reconstruction with bone graft and instrumentation.

The chances for improvement after surgery for cervical spondylotic myelopathy are approximately 60%.

ANTERIOR CERVICAL MICRODISCECTOMY – 3 YEARS RETROSPECTIVE STUDY OF A CONSECUTIVE SERIES OF 68 CASES

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Keywords: cervical, anterior microdiscectomy, fusion, herniation

OBJECTIVE

To analyze the last 3 years series of anterior microdiscectomy cases without fusion in cervical disk herniation.

METHODS

A series of 68 consecutive cases of cervical disk herniation operated by the authors' surgical team during July 1st 2005 – June 31st 2008 using the above mention technique is analyzed. Kerrison and hooks under microsurgical visualization were mostly used to remove soft and hard disk herniations at the canalar and foraminal levels. Uncal joints were always preserved. In a few cases a median partial corpectomy was performed to enlarge the visual field and stabilization with a long iliac crest bone graft was performed only in the cases with cervical stenosis at more than 3 levels (2 cases).

RESULTS

In 68 patients 103 herniated cervical disks were resected (8 at C3-C4 level, 14 at C4-C5level, 39 at C5-C6 level, 36 C6-C7, and 6 C7-D1). 24 cases presented multiple disk herniations with multiple discectomy (2 disks in 15 cases, 3 disks in 7 cases, and 4 disks in 2 cases). There were 35 males and 33 females, most affected age groups being 50-59 with 27 cases and 40-49 with 17 cases, ranging from the youngest at 25 and the oldest patient at 69.

Some particular cases were observed during this period: a centro-medullary spontaneous hemorrhagic infarction associated with disk herniation (necroptic study in a non-surgical case – early fatal outcome before interventional decision), a traumatic disk herniation, an adjacent cervical level herniation arising 1 year after the first discectomy, and 4 cases of cervical disk herniation in diskopatic patients with history of lumbar disk surgery.

As complications we mention transient dysphonia, in 7 cases, and transient brachial paresis in 4 cases, all these deficits completely resolved at 2 months follow-up. Local post-operative hematoma, 3 hours after the closure was rapidly evacuated and the arterial source

coagulated in one case with clinical consequences. The patients were advised to wear cervical orthosis if they feel necessary but that happened in only 7 cases for a period longer than 10 days. At 2 months follow-up no patient presented with signs of cervical instability and none needed the cervical orthesis longer than that. There were no deaths, and no additional permanent deficits in this series.

CONCLUSION

Anterior cervical microdiscectomy without fusion is a safe and relatively quick procedure to solve patients with single or multiple level disk herniation. Patients with 4 levels discectomy were fused so we have no experience whether discectomy at more than 3 levels without fusion has any consequences on vertebral stability. However, despite controversies in the literature we didn't observe signs of persistent cervical vertebral instability in our 66 patients with discectomy at 1 to 3 levels without fusion.

MICROSURGICAL TREATMENT OF LUMBOSACRAL RADICOLOPATHIES SUBSTAINED BY LATERAL RECESS STENOSIS TROUGH COMBINED MICROSURGICAL ROOT DECOMPRESSION AND BACJAC INTERSPINOUS DEVICE IMPLANT

GIUSEPPE GAMBARDELLA, CARMELO PECORA, SEZIONE CHIRURGIA VERTEBRO-MIDOLLARE CASA DI CURA VILLA SALUS, EMANUELE PUGLISI, SEZIONE MICROCHIRURGIA VERTEBRALE CASA DI CURA CRISTO RE MESSINA

Lumbosacral radicolopathies substained by lateral recess stenosis are common pathologies in increment in the latest years for increasing of medium age of the life. The aim of this study is to evaluate the improvement of these radicolopathies trough combined treatment of root's microsurgical decompression and implant of an interspinous spacer device,as the BacJac (Pioneer Technologies). We enrolled 85 patients in a prospective study, all affected by radicolopathy from lateral recess stenosis. All of theme underwent a microsurgical root decompression and 40 have been treated by combine implant of interspinous device, and 45 decided voluntarily to not concur the implant and have been used as control group. Results obtained were valutated trough comparation of specific tests performed preoperatively and 3 - 6 - 12 months after surgery, and clearly have shown that the microsurgical decompression is well effectiv on neurological deficits, but quality of life and reintervention requests are better in the group treated also by interspinous device implant.

STATISTICAL EVALUATION OF THE CLINICAL BENEFITS OF REHABILITATION IN PATIENTS WITH SPINE CORD INURY UNDERGOING COMPLEXE TREATMENT WITH SPECIFIC THERAPEUTICAL FACTORS FROM TECHIRGHIOL HELTH RESORT

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OBJECTIVES

To evaluate the clinical benefits of rehabilitation using natural factors from Techirghiol health resort: climate, sapropelic mud, salty water of the lake.

METHODS

Retrospective case-control study on 35 patients hospitalised in BRS Techirghiol from June, 1st 2007 to June, 1st, 2008 (12 month) with spine cord injury, undergoing specific rehabilitation treatment;

Qol scale, ASIA/AIS score, Ashworth scale were

applied before the beginning and at the end of cure according to the standard procedure used in rehabilitation department;

Cure duration: 18 days;

Including and exclusion criteria were applied;

complex treatment concerning: hydrotherapy and hydrokinetotherapy with salt water, mud bath or plant extract bath, kinetotherapy "à sec" in the gym room, massage and electrotherapy;

Statistic analysis of the results

MATERIALS

Sapropelic mud, mineral water from Techirghiol lake, glycerinate extract of medicinal plants;

All medical rooms and devices (sswimming pool, tubes, electrotherapy devices, kinetotherapy rooms and devices, massage rooms)

Batch presentation:

Total number of patients: 35

24 male and 11 female, with age average 41.3 years old, 17 of them with paraparesis, 11 of them with tetraparesis and 7 with other neurological damages (pain, dizziness, itch, needles), produced by: car accident (14 cases), fall down (13 cases) and other traumatic conditions (8 cases) were assessed using QoL and ASIA/AIS scale; time from the injury: mean 3.1 years with the limits between 2.5 month (3 cases) and 26 year (1 case)

RESULTS

Increase of ASIA/AIS scores for patients with B, C, D type of spine cord damage; Improvement of sphincter control; Improvement of sleep quality and duration; increase of Ashworth score; Improvement of quality of life. complex treatment concerning: hydrotherapy and hydrokinetotherapy with salt water, mud or plant extract, kinetotherapy "à sec" in the gym room, massage and electrotherapy.

CONCLUSIONS

Correct evaluation of patients status, using specific scales allowed to prescribe a complex treatment with specific natural therapeutical factors; Adequate administration of natural factors corroborate with progressive intensity of kinetotherapy and hydrokinetotherapy lead to the improvement of scores of patients; Increased duration and quality of sleep is produced by plant extract and/or mud bath; Due to the chemical and physical property of mud, muscle activity became better, spasticity decrease, sleep is deeper and concentration of patients during the therapeutical programme is higher; Socialisation is easier within a community of peoples with same problemmes and is stimulated further by the clinical benefits obtained during the cure; Quality of life of our patients is increase in many fields: self esteem, interest for treatment, encouraging other patients, implication in family life; The sooner balnear rehabilitation starts the better are the results.

ACHIEVEMENT OF AN EXPERIMENTAL MECHATRONIC ORTHOTIC DEVICE TO ASSIST /REHABILITATE ORTHOSTATISM AND WALK IN PATIENTS WITH COMPLETE PARAPLEGIA

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INTRODUCTION

This paper synthesizes the progressive development of an original type of mechatronic orthotic device (MOD –

which's integrator concept won the Gold Medal at the International Fair for Inventions, Geneva, 2008 – Fig.1), dedicated to the assistance/ rehabilitation of orthostatism and walk in paralyzed people, disabled "oldest olds" and/or in patients with severe cardio-respiratory conditions.

MATERIALS AND METHODS

From the descriptions analyses of some representative robotic orthotic structures, made by a variety of institutions, it resulted the necessity of improvement both on conceptual and functional plans, for which haven't yet been found the most adequate constructive solutions (1-5). We consider that a robotic/ MOD, in order to be really functional/ useful, must basically satisfy (6): weight & dimensions as reduced as possible; low energetic consumption and production costs; possibility of wearing it under clothes, including easy ways for dressing/ undressing; safe and comfortable position of the assisted person related to the MOD; biocompatibility properties, thermo-physiologic and sensitive comfort at the skin-orthose interface(assisted person's skin airing, uniforming & reducing contact pressure -including equipment for improving the venous-lymphatic return in the lower limbs – through an incorporated mobile peristaltic airwaves generator - Fig. 2); automatic maintaining of the orthostatic position and ability of straightening when disturbing factors occur; achievement of the main lagging functions, through a simple/ user-friendly selection of desired movements, by the assisted person; simple procedure of training, for optimal "man-machine interaction".

RESULTS

In the first stage on achieving/ testing MOD's main modules: actuators, specific to the working condition, (low weight & dimensions, high power & efficiency, max. 10ºC overheating); equipment and commanding programs of the main locomotors functions in sagittal plan (standing up, sitting down, forward movement, going up/ down on stairs, slopes); testing of functional and constructive aspects, for both mechanical ones and respectively, for those assuring biocompatibility conditions with the assisted person (optimized interaction solutions between MOD's internal face and the skin at contact areas; modulated underclothes system made of micro fiber with enlarged elasticity, bioactive, with increased comfort: seamless, brief trousers, co-chain type socks - Fig. 3); achievement subsequently, of an assay stand for MOD (Fig.4). In the second stage, were achieved and studied: the equipment with sensors (Fig. 5) for accomplishing automatic control elements of orthostatism and some of its straightening abilities to accidental disturbing factors, in sagittal plan; advanced construing of the main locomotors tasks accomplished by MOD. In the third stage (under actual sustained testing and improvement) there are successively optimized: supporting structure (Fig. 6), sensor equipment, command & actuating components, in purpose to upgrade MOD, in the future, in an under-wearable robotic orthotic suit; subsequently, the main steps are: safe real ground lagging (on plain surfaces); MOD's fitting out with spatial "hip" articulations; miniaturizing of all components; matching actuating with supporting structure/ functions. MOD might be improved too, adding to it a non-invasive – our option is not for the invasive way (7) - EEG ("wet" or even better "dry") collector cap (8, 9) of voluntary brain motor bio potentials (and possibly eye-tracking) records, real time decoded and wireless transmitted to MOD's actuating systems. Preliminary, in relation with a non-exo-skeleton fitted robotic device, there seem to be promising results, even on severe paralyzed (tetraplegic) patients (a cooperation of our clinic with a Berliner team of researchers – unpublished yet data).

DISCUSSION

MOD's components have many new elements – part of them under patenting - with possibilities to be used, some of them, as separated products, as well.

CONCLUSIONS

The achievement of most of the mentioned requirements of a functional MOD/ robotic suit, represents both, a major assistive/ rehabilitative objective and a hard interdisciplinary – in principal medical and engineering – challenge.

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ADVANCED BIO – MATERIALS/DEVICES & TECHNOLOGIES - SUPPORTING SPINE AND CORD REPAIR/REGENERATION

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Keywords: SCI, non-resorbable / resorbable gel-type implants, self-assembling scaffolds, organ 3D printing inside repair/ regeneration, scaffold-like structure RNA nanoscale machines

INTRODUCTION

Although spinal cord injuries (SCI) are a major public health problem because of their huge invalidating potential - and outcomes - little progress has been made yet, to improve neurological status which consist, in many cases, in lifelong disability. This fact put an important burden on the affected individuals, their families and society. Its annual social cost is estimated, for instance in the USA at $4-6 billion or even more.

BACKGROUND

The central nervous system (CNS) being the most sophisticated known structure within the Universe is perfect example for maximal interdependence between structure and function. The lower part of CNS, i.e. the spinal cord, couldn't make an exception; therefore, to heal lesions at this level implies not only cellular/axonal re-growth or/ replacement but - of equal importance – reproducing the cord's pre-lesion local architecture. So, regeneration/ repair and consequently, functional restoring / rehabilitation after SCI, passes inevitably through the cutting-edge process (at present still mainly experimental in the domain) of tissue engineering, in purpose to effectively reconstruct and thus, cure the spinal (injured) cord. Basically, tissue engineering means a controlled assembly of (stem) cells, growth factors, ligands, blood vessels/ angiogenesis, etc, in vitro or in vivo (eg. through in situ 3-D "bio-ink" printing or "filling the gap" by injecting into the lesion area elaborated scaffolds – some of the newest: self-assembling - capable to host and facilitate local bone or neural/ axonal growth, structuring and re-connection).

Main items and achievements: The advanced biomaterials contributive to spine & cord repair/ regeneration are divided in two main groups: non-resorbable and respectively, resorbable, gel-type implants. Within the first group recently, there have been started few human trials. The second category - also having a few products in clinical trials - comprises: organic, bioactive, resorbable (and/or self-assembling/nano-processed – including recently,

multiple-channel) scaffolding biomaterials. They might serve as a guide for neo-forming tissues, as delivery vehicles for cells and growth factors, as adjuvant in autologous or allogenic bone grafting and/or as an artificial, biodegradable material to stimulate bone or/and neural regeneration. Very recently, some of them evolved to different types of neuro gels, containing specific peptides, cell-adhesive region or fibronectin, (a near future - "living glue"); a groundbreaking principle: the use of a (micro)-inkjet printer, to "print" a "biological ink" ("bio-ink"), composed of cell aggregates, into a 3-D, biodegradable polymer gel, resulting in building organs from the ground- up, by the use of desktop printing technology; a novel laser forward-transfer process to direct write biological materials for matrix assisted pulsed laser evaporation (MAPLE DW), through which stem cells could be individually inseminated at the level of a matrix (tridimensional, biodegradable, scaffold, which imitates the nervous structures), able to induce also embryonic stem cell differentiation with appropriate growth factors, to determine cells to exhibit 3-D organization and thus, resembling primitive neural, cartilage or liver tissue; latest and seeming valuable: engineering nerve jumper cables for spinal cord repair in animal model, holds promise also for humans; a new biodegradable polymer matrix, "SpheroGel" is meant to deliver/coax embryonic ensheathing stem cells to grow inside the SCI gap; a sort of adavnced and complex biomaterials awaiting to be marketed hopefully soon: the therapeutic system of Cordaneurin, respectively Cordachron (in combination with e.g. Chemokine SDF-1gamma for the neuronal growth promotion and glial scar prevention). Very interesting and introducing bio/nano technological remarkable skills: the scaffold-like structure RNA nanoscale machines, from biological components.

DISCUSSION & CONCLUSION

The enounced, very new (last five years) and seeming revolutionary biomaterials and connected methods, are happily merging with strong advances in intimate cellular therapeutic manipulation techniques. At present and continuing for the next about three years, some reliable, specific trials, are/will be on going: for the first time it may be possible to expect from their results, consistent may be decisive improvements in SCI therapeutic rehabilitative outcomes.

THE EMERGENCY HOSPITAL "BAGDASAR – ARSENI"/ PHYSICAL & REHABILITATION MEDICINE CLINICAL DIVISION'S EXPERTISE IN THE NEUROTRAUMA WITHIN POLYTRAUMA, COMPLEX, POST-ACUTE APPROACH

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Keywords: neurotrauma, polytrauma, TBI, SCI, rehabilitation

BACKGROUND

Polytrauma means the presence of one or more (violent) traumatic lesions (multifarious and often associated: axial – including skull/ spine – or/and peripheral bone fractures, visceral contusions and/or ruptures) in minimum two anatomic regions, among which, at least one, is actually or potentially life threatening

Within our Clinical Emergency Hospital, the polytraumatised patient is examined by the emergency medical team, which evaluates and tries to stabilize the patient's vital signs and biological markers. Basic radiological and imaging investigations orientate the interventions of the multidisciplinary team (neurosurgeon, general surgeon, orthopedic surgeon). Afterwards, in the early post-acute phase, the stabilized patient is admitted in our PRM clinical division.

OBJECTIVE

Statistically presentation and evaluation of our results in the neurotrauma within polytrauma complex, post-acute approach.

MATERIAL AND METHOD

Retrospective statistical study, on a series of 93 cases (gender 68M, 25F), admitted during 2007, splitted following the principal nevraxial lesion criteria: 38 (40.9%) TBI, 28 (30.1%) SCI, and mixed associated TBI plus SCI 27 (29%) subjects. The mean hospitalization length was 30 days for each patient; some of them were readmitted.

The comprehensive neuro-motor rehabilitation was physical/ kinetically therapy programs based, adapted to the peculiar clinical neurological and general status of each patient, including initially rehabilitative nursing.

All the inpatients received aside, a rather equivalent complex, pharmacological therapy, icluding the modern neurotrophics Cerebrolysin® or/and Actovegin®

The assessment of patients was objectived by functional independence measure (FIM) at admission/discharge.

RESULTS

Etiology was: car accidents (68.8%), falls from height (25.8 %), diving in water (2.1%), same level falls (2.1%), aggression (1.1%)

The associated traumas were: orthopedic lesions (39.8 %); visceral contusions or/ and ruptures (48.4%), mixed bone fractures associated with visceral lesions.

Within the TBI, lot were 16 aphasic patients (12 improved, 4 stationary at discharge – assessed with our specific clinical scale).

Regarding FIM: for the TBI lot (aFIM= 45,3; dFIM=60,9); the SCI group (aFIM= 54,8; dFIM=74); for the mixte neuraxial polytrauma (aFIM= 52,7; dFIM=66,6).

Evolution status at discharge: improvement in 87.1 % cases; stationary at 12.9 % patients.

DISCUSSION

Our results are, overall, comparable to those obtained in different good neurotrauma within polytrauma units, worldwide

CONCLUSIONS

Precocious, comprehensive, multi-/interdisciplinary team approach is the appropriate treatment algorythm, for the polytraumatized, with neurotrauma patient.