

improving patient outcomes. Future directions would involve urging local governments and stakeholders to action further training and funding in molecular pathology testing and the use of advanced surgical adjuncts.

BRAIN AND SPINE 1 (2021) 100307 100785 CALIPER NAVIGATION FOR CRANIOTOMY PLANNING OF CONVEXITY TARGETS

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Introduction: A technique to localize a radiological target on the head convexity fast and with acceptable precision is sufficient for surgeries of superficial intracranial lesions, and of help in the setting of emergency surgery, computer navigation breakdown, limited resources and education.

We present a caliper technique based on fundamental geometry, with inexpensive and globally available tools (cuboid CT or MRI data set, image viewer, calculator, caliper).

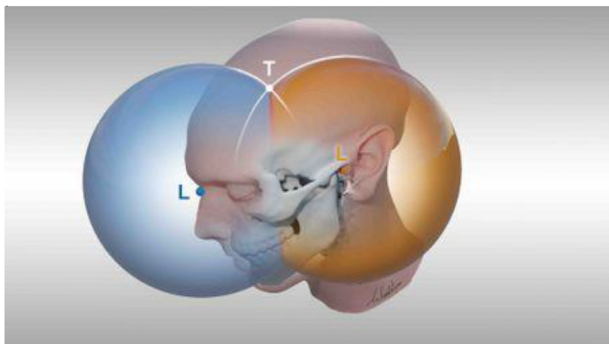
Methods: The distances of the radiological target from two landmarks (nasion and acoustic porus) are assessed with an image viewer and Pythagoras' theorem. The two distances are then marked around the landmarks onto the head of the patient with help of a caliper. The intersection defines the target.

We tested the technique in a saw bone skull model and afterwards in the operating room. Convexity targets were localized with the caliper navigation technique and then with computer navigation as ground truth.

Results: In the saw bone model, the mean offset between the caliper navigated target and the real target was 3.2 ± 2.4 mm. The mean offset between computer navigated target and real target was 1.8 ± 1.1 mm ($p < 0.05$).

In 15 patients undergoing navigated cranial procedures, 100 targets were assessed in reference to computer navigation. The mean offset of the caliper navigation was 10.9 ± 5.2 mm (confidence interval 9.9 – 11.9 mm; $a = 0.05$).

Conclusion: This is a low-tech approach for translation of a radiological target to the patient's head in short time and with globally available inexpensive tools, with satisfying precision for many procedures.



BRAIN AND SPINE 1 (2021) 100307 100786 THE BEHAVIOR OF 5-ALA IN PRIMARY AND HISTOLOGICAL SUBTYPES OF BRAIN METASTASES: A SYSTEMATIC REVIEW AND METAANALYSIS OF THE CURRENT LITERATURE

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Background: While routine use of 5-Aminolevulinic acid (5-ALA) fluorescence has become a well-established standard in glioma surgery, its role in the resection of brain metastasis remains controversially discussed, due to inconsistency and heterogeneity of fluorescence. This review investigates the different expressions of 5-ALA fluorescence in various types of metastases and analyses the possible link between fluorescence and primary tumor type.

Methods: We conducted a systematic review using PubMed/medline database according to PRISMA guidelines. All original publications published until February 2021 were screened. Inclusion criteria were: (1) documentation of intra-operative 5-ALA behavior in brain metastases, (2) publication in English, (3) >1 patient included and (4) description of subtypes of primary tumors. A

meta-analysis of the selected studies was performed.

Results: Out of $n=44$ studies screened, $n=12$ studies met the inclusion criteria, comprising $n=534$ patients. 5-ALA fluorescence positivity was described in 264/534 of the cases (49%). Primary tumor could be determined in 476/534 patients, whereas 58 patients suffered from a cancer of unknown primary (CUP). Lung carcinoma was the most frequently reported primary tumor ($n=237$) with 5-ALA+ in $n=120/237$ (50.6%); followed by mamma carcinoma ($n=75$) with 5-ALA+ in $n=42/75$ (56%); gastro-intestinal cancer ($n=54$) with 5-ALA+ in $n=24/54$ (44%); urogenital ($n=52$) with 5-ALA+ in $n=23/52$ (55%); and other cancer groups ($n=34$), with 5-ALA+ in $n=21/34$ (62%).

Conclusion: Brain metastases show a positive fluorescence in only 49% of the cases. There is no correlation between the presence of fluorescence and the primary tumor type, with a range of 5-ALA+ reported between 38-62%. Based on this literature review, the use of 5-ALA for surgery of brain metastasis is questionable. To support gross total resection of metastatic lesions, future studies should focus on the improvement of fluorescence expression and/or detection, and the exploration of alternative imaging techniques.

BRAIN AND SPINE 1 (2021) 100307 100787 HOW DO WE TREAT THE PATIENTS WITH PENETRATING TRAUMATIC BRAIN INJURY - A MULTICENTRE STUDY COLLABORATING SOUTH AFRICA, SWEDEN, FINLAND AND THE UK

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Background: Due to the less funding and no appropriate multicentre research efforts, evidence-based treatments of traumatic brain injury (TBI) are still not established in low-income and middle-income countries (LMICs), however, the hospitals of these countries are treating a significant fraction of global TBI. The primary goal of our project is to report the epidemiology, neurological and radiological findings, operative and non-operative managements and outcome of patients with penetrating TBI (Pen-TBI) in a tertiary level hospital of South Africa (SA). Additionally, to study the burden of Pen-TBI on neurosurgical healthcare resources in SA.

Methods: This is a prospective, clinical, multicentre, observational study where the data will be collected in the Division of Neurosurgery, University of Cape Town (UCT), SA and the same will be extracted from the Swedish Trauma Registry during 2020-22. This will establish the first official TBI registry in the UCT including adult and paediatric groups. Blood samples will be obtained on the first three days following admission to study the blood biomarkers to reveal the complex pathophysiology of severe TBI. The data of cost, theatre time, number and type of neurosurgical procedures, duration of admission, diagnostic imaging studies performed, blood products used, laboratory studies ordered, and medications administered will be collected to perform the health economics analysis.

Results: After one year of enlisted data collection (please check the table), we will report the results on the basis of the goals of this project. When the prospective data collection will be completed for three years, a comparative analysis will be done between the cohorts of SA and Sweden.

Conclusion: This novel study will help to evaluate the interventions of Pen-TBI tailored for use in LMICs and will nurture the TBI research capacity in LMICs through global collaborations in neurosurgery.

- Date of Birth
- Age
- Gender
- Date and time of injury
- Date and time of admission
- Mechanism of injury
- Total GCS on scene (prior to intubation)
- Admission GCS total and motor
- Pupils
- Neurological focal signs