NICO Myriad SPECTRA

The **NICO Myriad SPECTRA** system is a state-of-the-art surgical tool specifically designed for minimally invasive neurosurgery. It integrates advanced features for precise tissue resection, enhanced visualization, and efficient workflow management, making it highly effective for treating complex intracranial pathologies, particularly deep-seated brain lesions.

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Key Features of NICO Myriad SPECTRA

1. **Dual Light Source**:

    1. The system offers in situ alternating **white light** for standard illumination and **blue light (405 nm)** for fluorescence visualization, particularly useful for 5-ALA-guided glioma resections.
    2. This improves the surgeon’s ability to differentiate between healthy and pathological tissues in real time.

2. **Microdebrider Technology**:

    1. Allows precise and controlled resection of both soft and fibrous tissues.
    2. The device is suction-based, reducing the risk of collateral damage while providing continuous tissue removal and a clear surgical field.

3. **In Situ Light Delivery**:

    1. The integrated light source delivers illumination directly to the surgical site, avoiding obstructions caused by external light sources.
    2. It provides targeted illumination within 15 mm of the tissue surface.

4. **Enhanced Visualization**:

    1. Combines advanced optical capabilities with minimally invasive access to improve the clarity and contrast of anatomical structures.
    2. Helps identify tumor boundaries, satellite lesions, and differentiate recurrent tumors from radionecrosis.

5. **Compatibility with Tubular Retractors**:

    1. Optimized for use with systems like the **BrainPath tubular retractor**, enabling safe access to deep-seated brain regions.

6. **Minimally Invasive Design**:

    1. Designed to work through small cortical openings, reducing patient morbidity and recovery time.

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Clinical Applications

1. **Tumor Resection**:

1. High-grade gliomas (e.g., glioblastoma).
2. Metastatic lesions and other deep-seated brain tumors.
3. Tumors involving critical areas like the subventricular zone.

2. **Fluorescence-Guided Surgery**:

1. Enhances visualization of 5-ALA fluorescence during high-grade glioma resections.
2. Improves the extent of resection while sparing normal brain tissue.

3. **Minimally Invasive Parafascicular Surgery (MIPS)**:

1. Used in conjunction with tubular retractors to address lesions in deep brain regions.
2. Useful for subcortical and intraventricular lesions.

4. **Redo Surgeries**:

1. Helps in distinguishing tumor recurrence from treatment-related changes such as radionecrosis.

5. **Multifocal Lesions**:

1. Identifies and resects satellite lesions in cases of multifocal pathology.

6. **Other Pathologies**:

1. Intracranial hematoma evacuation.
2. Resection of cystic lesions or vascular malformations.

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Advantages

1. **Improved Surgical Precision**:

1. Combines advanced resection and visualization technologies to minimize damage to healthy tissue.

2. **Enhanced Resection**:

1. Facilitates identification of tumor margins and increases the extent of tumor removal, potentially improving patient outcomes.

3. **Reduced Recovery Time**:

1. Minimally invasive nature leads to shorter hospital stays and quicker postoperative recovery.

4. **Versatility**:

1. Effective across a wide range of pathologies and surgical scenarios.

5. **User-Friendly**:

1. Seamlessly integrates with existing neuronavigation and imaging systems.

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Challenges and Considerations

1. **Learning Curve**:
    1. Surgeons need specific training to optimize the use of the system, particularly its light-guided capabilities.
2. **Cost**:
    1. The proprietary technology may have a high acquisition and operational cost, limiting its availability in resource-constrained settings.
3. **Limited Accessibility**:
    1. Requires advanced surgical infrastructure and compatible technologies like neuronavigation systems.

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Conclusion

The **NICO Myriad SPECTRA** system represents a significant advancement in neurosurgical technology, particularly for minimally invasive and fluorescence-guided procedures. Its ability to enhance visualization, improve resection precision, and reduce patient morbidity makes it a valuable tool for treating complex brain pathologies. However, wider adoption will depend on addressing training, cost, and accessibility challenges.

Single-centre retrospective proof-of-concept studies

The preliminary results from a single-centre retrospective study are presented from the first 35 patients operated upon with the novel Nico Myriad Spectra System©. The microdebrider (Myriad) with an additional in situ light system (Spectra) can alternately provide white and blue light (405 nm) to within 15 mm of the tissue surface to enhance the morphology of the anatomical structures and the fluorescence of the pathological tissues.

A total of 35 patients were operated upon with this new technology. Eight patients (22.85%) underwent tubular retractor-assisted minimally invasive parafascicular surgery (tr-MIPS). The majority had high-grade gliomas (68.57%). Fluorescence was identified in 30 cases (85.71%), with residual fluorescence in 11 (36.66%). The main applications were better white-blue light alternation and visualisation during tr-MIPS, increase in the extent of resection at the border of the cavity, identification of satellite lesions in multifocal pathology, the differentiation between radionecrosis and tumour recurrence in redo surgery and the demarcation between normal ependyma versus pathological ependyma in tumours infiltrating the subventricular zone.

This proof-of-concept study confirms that the novel in situ light-source delivery technology integrated with the usual intraoperative armamentarium provides a spatially, functionally and oncologically informed framework for glioblastoma surgery. It allows for the enhancement of the morphology of anatomical structures and the fluorescence of pathological tissues, increasing the extent of resection and, possibly, the prognosis for patients with high-grade gliomas [1)]

This proof-of-concept study showcases the potential of the Nico Myriad Spectra System to improve visualization and enhance glioblastoma resections. However, its limitations, including small sample size, lack of comparative data, and retrospective design, mean its findings must be interpreted cautiously. While the preliminary results are encouraging, further prospective and randomized studies are essential to confirm its efficacy, broader applicability, and impact on long-term patient outcomes.

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Lavrador JP, Marchi F, Elhag A, Kalyal N, Mthunzi E, Awan M, Wroe-Wright O, Díaz-Baamonde A, Mirallave-Pescador A, Reisz Z, Gullan R, Vergani F, Ashkan K, Bhangoo R. In Situ Light-Source Delivery During 5-Aminulevulinic Acid-Guided High-Grade Glioma Resection: Spatial, Functional and Oncological Informed Surgery. Biomedicines. 2024 Nov 30;12(12):2748. doi: 10.3390/biomedicines12122748. PMID: 39767656; PMCID: PMC11673840.