Neurology Case Series

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Dear Doctor,

Greetings from Micro Labs Limited.

We are happy to bring you "Neurology case series", which contains latest and interesting cases in the field of Neurology.

This issue contains

1. **Case report on the utilization of imaging in falcotentorial meningiomas**
2. **Case report on ventriculoperitoneal shunt placement using a markerless augmented reality system**
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Should you require any specific article or medical information, please feel free to contact us at medicalservices@microlabs.in

Looking forward to your valuable feedback

Best Regards,

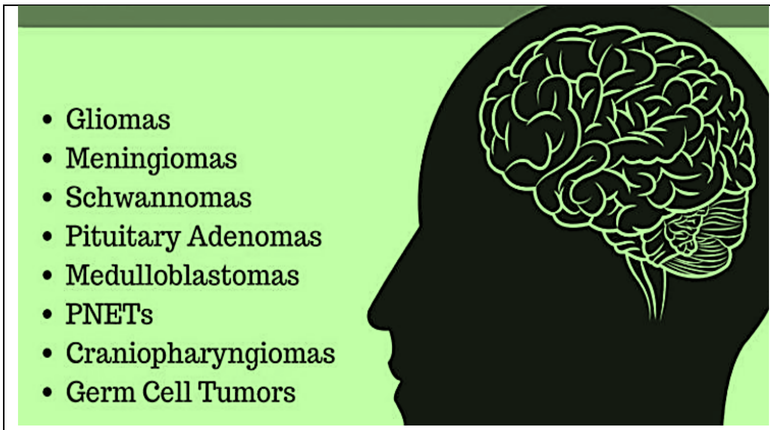
Medical Team,

1. Case report on the utilization of imaging in falcotentorial meningiomas

Introduction:

Falcotentorial meningiomas are rare tumors that need careful preoperative imaging and surgical planning. To facilitate neurosurgery, radiological reports should indicate the tumor's relationship to the Galen vein.

Falcotentorial meningiomas are uncommon extra-axial intracranial tumors that form at the intersection of the falx cerebri and tentorium.[1] Only 3–8% of tumors in the pineal area are meningiomas. Pineal meningiomas are classified as falcotentorial or velum interposition based on their topographic origin. Falcotentorial meningiomas develop at the junction of the tentorium and the falx cerebri. Only 1-2% of meningiomas are falcotentorial meningiomas. Diagnosing a pineal tumor might be challenging due to compression from velum interposition meningiomas.[2] Preoperative imaging is critical for effective surgical planning and management. Magnetic resonance imaging (MRI) was the recommended imaging modality for diagnosing meningiomas due to its higher soft-tissue contrast resolution.[1] This case report presented a type 1 falcotentorial meningioma and discussed the importance of preoperative imaging and therapy.



Types of brain tumors

Case Presentation:

A 62-year-old female patient experienced growing bilateral lower limb weakness over 6 months. Her medical history was normal whereas, clinical examination indicated hypertonia and hyperreflexia in both lower limbs, as well as reduced power. No sensory abnormalities or bowel/bladder involvement were observed. Magnetic Resonance Imaging (MRI) was used to examine the patient's neurological problems. A contrast-enhanced MRI (CEMRI) revealed a lobulated extra-axial lesion around the falcotentorial junction and surrounding dural tail. The lesion was situated posterior to the inferior free margin of the falx cerebri. The imaging findings were compatible with a type 1 falcotentorial meningioma. In T1-weighted images (T1W), the lesion was iso- to hypointense compared to the gray matter (Figure. 1A). T2-weighted and fluid-attenuated inversion recovery (FLAIR) images showed a hyperintense lesion (Figure. 1B).

T1W images with contrast enhancement showed significant heterogeneity (Figure. 1C and 1D). There were no signs of blooming or diffusion limitation inside the lesion. The bilateral internal cerebral veins and great cerebral vein were shifted inferiorly (red arrows in Figure. 1D). The patient was referred for neurosurgical examination and further treatment.

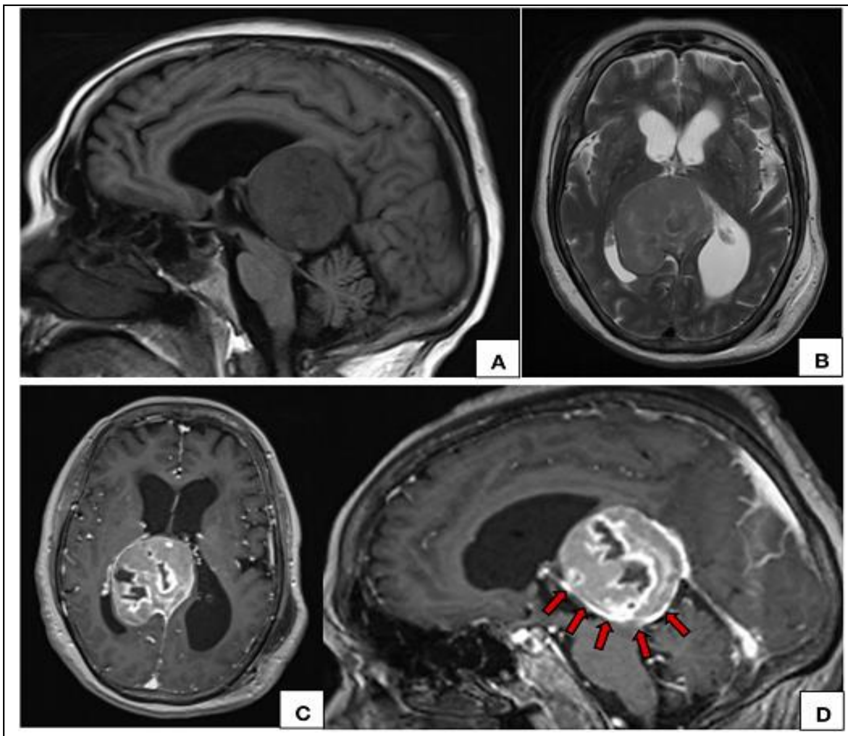


Figure 1. In T1-weighted images (T1W), the lesion was iso- to hypointense compared to the gray matter (A); T2-weighted and fuid-attenuated inversion recovery (FLAIR) images showed a hyperintense lesion (B). The bilateral internal cerebral veins and great cerebral vein were shifted inferiorly (C and D)

Discussion:

Falcotentorial meningiomas are uncommon cerebral tumors caused by arachnoid cap cells near the falcotentorial junction, which connects the falx cerebri and tentorium cerebelli. Preoperative imaging was critical for identifying and managing falcotentorial meningiomas. To facilitate neurosurgery, radiological reports should indicate the tumor's relationship to the Galen vein. Contrast-enhanced magnetic resonance imaging (CEMRI) was the preferred imaging modality for these malignancies due to its ability to effectively define tumor size and connection with surrounding tissues.[1] Furthermore, Dalle Ore CL et al. showed that imaging can help planning surgeries by providing information on tumor vascularity and blood supply.[3]

Conclusion:

Falcotentorial meningiomas were rare tumours that require careful preoperative imaging and surgical planning. To help in neurosurgery, radiological reports should indicate the tumor's relationship to the Galen vein. Although surgical resection is the recommended treatment, subtotal resection may be considered in some situations. Patients undergoing subtotal resection require close imaging follow-up.

Reference:

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3. Dalle Ore CL, Magill ST, McDermott MW. Falcotentorial meningiomas. Handb Clin Neurol. 2020;170:107-114.

2. Case report on ventriculoperitoneal shunt placement using a markerless augmented reality system

Introduction:

Inserting a ventriculoperitoneal (VP) shunt is a common neurosurgery operation for treating hydrocephalus. Despite being a common treatment, shunts have a failure rate of up to 39% in a year.[1] The VP shunt consists of four parts: a proximal catheter that enters into the lateral ventricle, a one-way valve and reservoir to manage intra-ventricular pressure, and a distal catheter that tunnels under the skin and drains into the peritoneum. According to studies, up to half of all paediatric shunts fail within the first year of placement.[2] Catheter blockage is the most likely cause of failure. Other reasons of shunt failure include infection, overdrainage, and mechanical failure. To reduce high failure rates, optimizing the method with accurate placement is crucial. Augmented reality (AR) technology has the potential to enhance the accuracy and effectiveness of neurosurgical procedures. This technique offers surgeons a 3D image of target anatomy and adjacent structures, allowing for more accurate and successful surgical planning.[1] This case analysed the effectiveness of a new AR registration method for planning VP shunt insertion.

The AR (Augmented reality) technique was utilized to design the placement of the VP shunt in the operating room. This technology is user-friendly and offers an anatomical image of the patient, allowing for the planning of the best possible trajectory.

Case Presentation:

A 62-year-old man with a history of subarachnoid hemorrhage developed delayed hydrocephalus and needed a right VP shunt. The CT scan indicated dilated ventricles (Figure 1). 3D models were created using the patient's preoperative CT scan received the morning before the operation. ITKsnap was used to manually segment anatomy of interest, including the skull and ventricles. The patient's face was segmented and rebuilt using auto-segmentation methods. The segmented structures were combined and transformed into a 3D model. Hoth Intelligence created an AR software for the Microsoft HoloLens 2 HMD.

This study's application uses a unique markerless registration approach to superimpose 3D digital representations on the head. To register the subject's anatomy, the user looks at subject's head while wearing the HMD. The AR headset was used to register a patient-specific 3D model onto the patient's skull once they were in the operating position (Figure 3). After the patient was registered, the doctor was free to move around the patient and view the 3D model superimposed on the patient's head from various angles. The clinician used a holographic trajectory tool to examine insertion locations and techniques for shunt implantation (Figure 2).

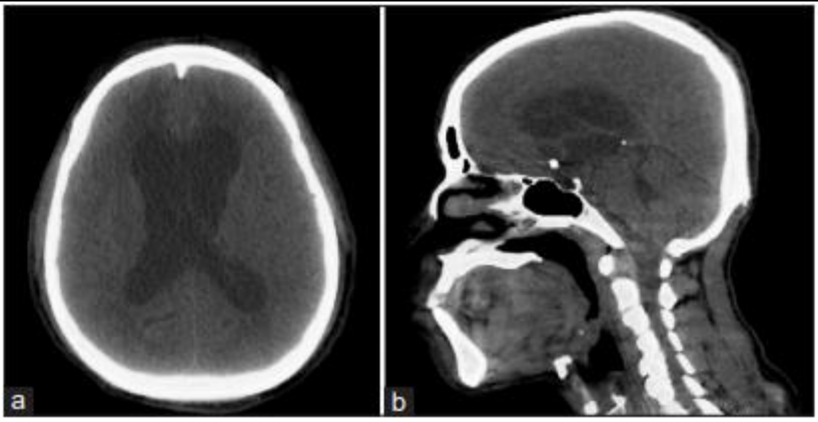

Figure 1. A diagnostic CT examination showing the vestibular schwannoma on the (a) axial and (b) sagittal CT.

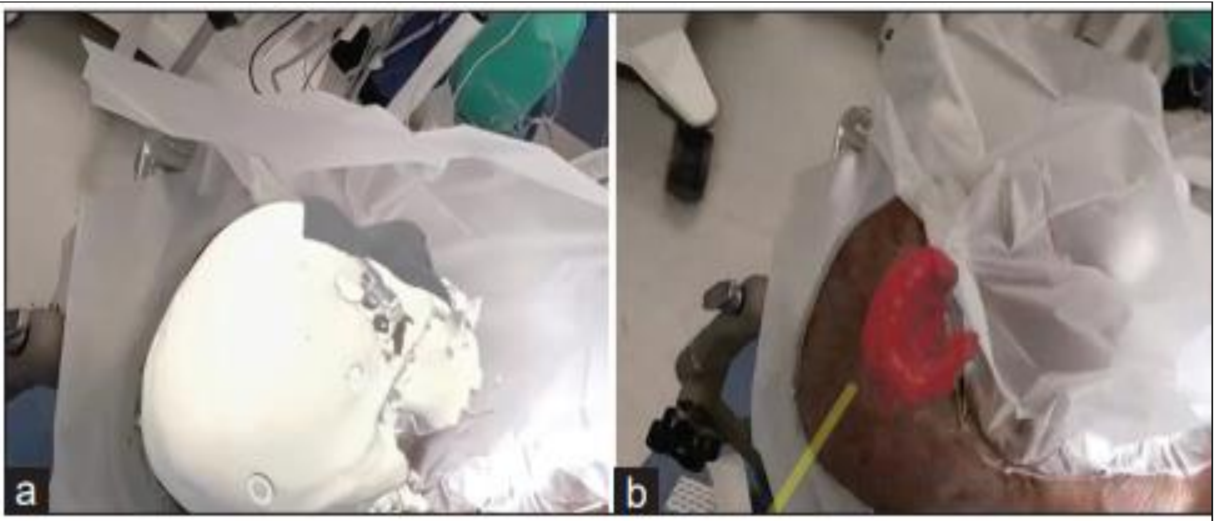

Figure 2. A surgeon's perspective via an augmented reality headset showing (a) a 3D reconstruction of the patient's skull superimposed on the patient's head and (b) a 3D reconstruction of the patient's ventricle with the insertion trajectory superimposed on the patient's head.

In this case, the AR headset was utilized to design the trajectory and approach prior to catheter placement, but was not worn throughout the procedure. The head, neck, and abdomen were prepared for incision. Dissection was extended down to the periosteum, where a burr hole was made. After coagulating and incising the dura, the catheter was guided into the ventricle using neuronavigation. The proximal catheter was attached to the valve and anchored to the bone. The distal catheter was advanced to the right upper quadrant of the abdomen, attached to the reservoir, and tested. A right lower quadrant skin incision was used to insert a trocar into the peritoneal cavity. The tip of the shunt tube was subsequently submerged in the lower right quadrant. The galea and skin incisions were then closed.

Discussion:

This case presented a novel use of augmented reality for presurgical planning of VP shunt insertion. AR technology was emerged promising in neurosurgery, with applications including neuroanatomy education, surgical training, and intraoperative assistance.[1] Grace Hey et al. showed that AR assistance has demonstrated potential in neuro-oncology, spinal neurosurgery, neurovascular surgery, skull-base surgery, and pediatric neurosurgery. AR was shown to be most useful for intraoperative surgical planning and neuronavigation. Similarly, AR help in neurosurgery training focused primarily on surgical planning and neuronavigation.[3]

Conclusion:

This study investigated the use of AR visualization to design VP shunt implantation. This technology improved surgical planning by providing clear vision and easy setup. Further research was needed to assess the accuracy, influence on surgical outcomes, cost, and usefulness of this unique technology in many clinical settings.

References:

1. Olexa J, Trang A, Flessner R, Labib M. Case report: Use of markerless augmented reality system for ventriculoperitoneal shunt placement. Surg Neurol Int. 2023 Dec 29;14:447.
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3. A case report showing severe neurocysticercosis through gait and cognitive disorders

Introduction:

Neurocysticercosis (NCC) occurs when the larval stage of Taenia solium, a pig tapeworm, infects the CNS and meninges. NCC is now common and is the most frequent helminthic infection of the central nervous system. Parasites can cause pathological alterations in the brain, subarachnoid space, ventricular system, and spinal cord, resulting in pleomorphism in this condition. The most frequent clinical manifestation was seizures/epilepsy, however, patients may also have headaches, focal impairments, intracranial hypertension, or cognitive deterioration.[1] Its symptoms vary depending on the lesion's morphology, size, and evolutionary stage. Cognitive assessments are not a standard evaluation for patients with neurocysticercosis.[2] This case report described a 59-year-old farmer who experienced a first episode of generalized tonic-clonic seizures lasting less than 2 minutes.

Seizures are the most common cause for consultation with neurocysticercosis, however individuals may have underlying cognitive issues.

Case Presentation:

A 59-year-old farmer who experienced a first episode of generalized tonic-clonic seizures lasting less than 2 minutes. He experienced walking difficulties for 5 months, which had worsened during the past 3 months. He goes slowly and hesitantly, as if unsure of how to move forward. He felt like his feet had been fixed to the earth while walking. He needed to increase the space between his feet for a more balanced walk. However, no incident of falls have been reported.

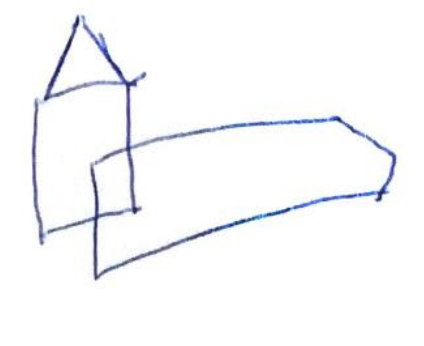

Figure 1. Constructive apraxia

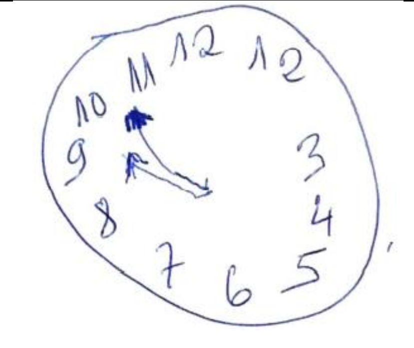

Figure 2. Defect in visuo-spatial representation during the clock test.

Walking apraxia was discovered during a clinical examination, with an expansion of the sustentation polygon and magnetization when walking, as well as the inability to walk with an ante flexion posture as the walking progressed. The finger-nose test in both upper limbs revealed distinct kinetic cerebellar syndrome with hypermetria. The patient experienced frontal syndrome, including dysexecutive syndrome, decreased verbal fluency, programming malfunction, disinhibition, grasping, and urine incontinence. His Frontal Assessment Battery (FAB) score was 10/17. He had constructive apraxia (Fig. 1) and a 7/10 score on Rouleau's clock test for visuo-spatial representation (Fig. 2). Language, gnosia, memory, and temporo-spatial orientation were all preserved, with the Mini Mental State Examination (MMSE) of 24/30. During a regular examination, discovered a 0.5 cm subcutaneous lump in the left temporal muscle. It was not painful, firm to touch, movable, and the surrounding skin appeared healthy. The patient's contrasted brain CT scan revealed cystic hypodensities with centimetric calcium hyperdensities in the parietal, frontal, and cerebellar hemispheres, as well as meningeal bulky cystic hypodensities with ventricular connecting ectasias (Fig. 3). The investigation found neurocysticercosis lesions with vesicular cysts in supra- and sub-tentorial and meningeal locations, as well as racemose forms with communicating hydrocephalus. In the left temporal muscle, there was also a rounded cystic hypodensity that may indicate muscle cysticercosis (Fig. 3). Cysticercosis was not found to be intraocularly localized. The

Figure 3. Bulky cystic hypodensities in the meninges, associated with left temporal muscle cysticercosis and ventricular communicating ectasias.

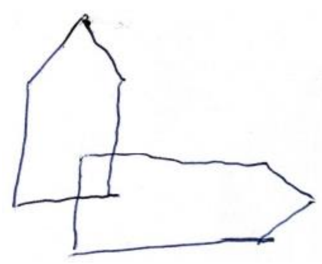

Figure 4. Disappearance of constructive apraxia

Figure 5. Clock test increase at 10/10.

biological examination did not indicate any inflammatory or infectious syndromes. The patient received carbamazepine (10 mg/kg/day) for seizures, corticosteroid treatment (1 mg/kg), and praziquantel (50 mg/kg/day) for 15 days. He had a successful lumbar evacuation puncture and underwent physical therapy. Following the first and second days of larvicide, the patient was discharged home. One month later, cognitive scores improved significantly (FAB at 15/18 on conflict instructions, go-no-go test, and Luria sequence; clock test to 10/10; MMSE at 27/30; and absence of constructive apraxias (Figs. 4 and 5). The patient's gait returned to normal, and the finger-nose test no longer showed dysmetry. Due to the patient's loss of follow-up, no control CT scan was conducted.

Discussion:

In the present case, patient experienced significant improvement after receiving antiepileptic medication, lumbar puncture, corticosteroid treatment, antiparasitics, and physical therapy.[2] In a previous study by Saeed Ahmed et al. on neurocysticercosis presented as psychosis was treated with albendazole, an antiparasitic, and haloperidol, an antipsychotic.[3]

Conclusion:

Seizures are the most common reason for consultation in neurocysticercosis, however patients may also have underlying cognitive disorders. Neurocysticercosis, including racemose form and hydrocephalus, can cause non-degenerative dementia syndrome and can be managed.

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4. Abnormal Course of the Superficial Branch of the Radial Nerve- A Case report

Introduction:

The radial nerve, the largest branch of the brachial plexus, begins in the axilla and travels through the triangular interval to the radial groove on the back of the humerus. It then enters the arm's anterior compartment by piercing the lateral intermuscular septum above the elbow. The lateral epicondyle in the cubital fossa separates this nerve into two superficial and deep branches.[1] The superficial branch of the radial nerve (SBRN) is a sensory nerve that regulates the dorsal region of the hand. The nerve starts in the cubital fossa, travels beneath the brachioradialis muscle, exits in the distal portion of the forearm, and continues through the subcutaneous tissue to the hand.[2] SBRN in the forearm typically follows a consistent path, however, there may be variations in course and position. Previous studies showed anatomical differences in the radial nerve, particularly its superficial branch.[1] This article described a case of variation from the normal course of the SBRN nerve.

When diagnosing and treating conditions like Werther's syndrome, the location and trajec tory of the Superficial Branch of the Radial Nerve can be crucial information for surgeons, radiologists, and physiotherapists.

Case Presentation:

During the dissection of the left upper limb of a 57-year-old male (donated cadaver), two median incisions were made in the anterior and posterior forearms, followed by two circular incisions around the wrist and elbow, according to dissection guidelines. Next, incise the skin of the hand using a central longitudinal incision in both the front and the back. Following that, the skin on these areas was removed, and the superficial fascia was used to identify the cutaneous nerves and veins. In the following stage, started to identify the muscles and other deep tissues by excising the superficial fascia and other surface structures. A deviation in the superficial branch of the radial nerve's path was discovered during the nerve's course trace. Rather than following its usual path between the tendons of the brachioradialis and the ECRL muscle, SBRN was transmitted via the brachioradialis muscle tendon in the present case. The brachioradialis tendon in this instance had two splits, the anterior split being bigger and broader and the posterior split being weaker and thinner. The superficial branch of the radial nerve was formed by passing through these two splits. Additionally, these nerves were examined for normal anatomical changes, taking into account the typical connections between the superficial branch of the radial nerve and the posterior cutaneous nerve and the external cutaneous nerve of the forearm. Upon examination of the other nerves in the upper extremities, no anomalies were discovered. Notably, the right brachioradialis tendon's morphology and the right radial nerve's distribution and course in the hand and forearm were both completely normal. This was the only case among 55 freshly dissected cadavers (male and female) in the dissecting room (Figure 1).

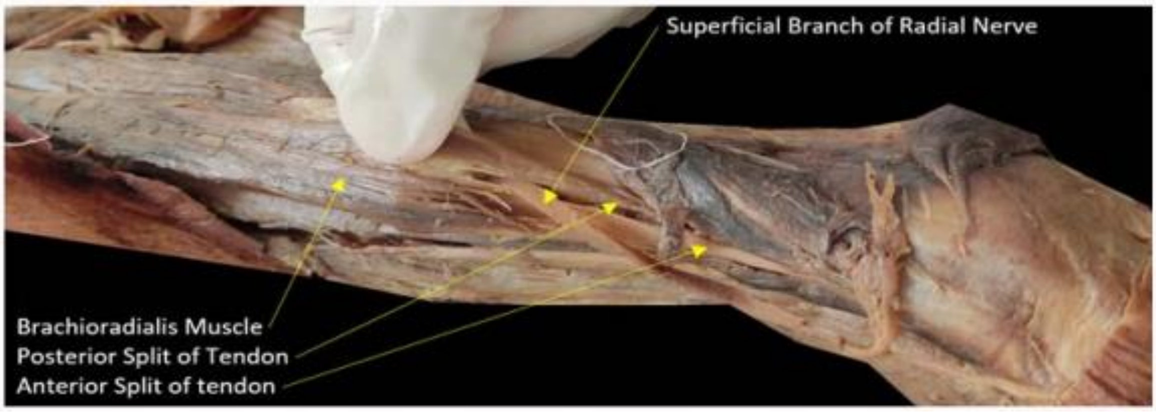

Figure 1: Radial Nerve

Discussion:

The area where the superficial branch of the radial nerve crosses the tendon of the ECRL and the brachioradialis was one of the most common sites for radial nerve entrapment and compression. The entrapment of the superficial branch of the radial nerve results in the mononeuropathy known as Wartenberg's Syndrome. The brachioradialis tendon's posterior side was frequently the site of entrapment for this nerve when it becomes superficial, however, it can get compressed in other locations as well.[1] Devin C. Potter et al. showed that Wartenberg syndrome can develop when external factors compress the superficial radial nerve. It might also be caused due to anatomical differences, such as a split brachioradialis tendon that entraps the nerve.[3]

Conclusion:

There have been numerous reports of the SBRN going through the brachioradialis tendon, and there may be more in the future. This variation should thus be taken into account when determining the cause of Wartenberg's syndrome. This kind of entrapment can exhibit all symptoms of Wartenberg's syndrome. Hypoesthesia, numbness, tingling, and burning-type pain near the thumb's radial side and dorsum were some of these symptoms.

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