Complete Paraparesis Following Resection of Parasagittal Meningioma: Recovering Function with an Early Intensive Neurorehabilitation Program

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SUMMARY

Paraparesis can occur as a primary presentation of brain pathology at the motor strip along the parasagittal region. It could also occur as a neurological complication especially following resection of parasagittal meningioma with infiltration of the superior sagittal sinus (SSS). We report a case of a complete paraparesis immediately following resection of bilateral parasagittal meningioma with infiltration of the middle third of the SSS. A gradual improvement in neurological recovery and functional outcome was observed over a period of one year after undergoing an intensive neurorehabilitation program beginning from the acute inpatient phase post surgery.

KEY WORDS:
Paraparesis, Meningioma, Superior sagittal sinus, Rehabilitation

INTRODUCTION

Paraparesis is one of the motor morbidities following surgical resection of parasagittal meningiomas invading the superior sagittal sinus (SSS)[1]. It is not uncommon for the neurological deterioration to be temporary in nature where the patient fully recovers within the first few days post surgery[2]. However, serious neurological complications may ensue and the limb weaknesses may persist longer. An early referral for an intensive neurorehabilitation program is important to improve the final functional outcome.

CASE REPORT

A 31 year old woman presented to our hospital with recurrent left lower limb jerky movement that had been present for three months. It was progressively associated with generalized tonic clonic seizure in the prior one week. The findings of neurological examination were not remarkable.

Magnetic resonance imaging (MRI) of the brain revealed a large parasagittal extra-axial mass lesion near the vertex, measuring 4 cm x 3.3 cm x 4.6 cm (Figure 1) and magnetic resonance venography (MRV) of the brain showed infiltration of mass to the middle third of the SSS together with formation of perilesional collateral venous channels. Radiological finding was compatible with parasagittal meningioma and was later confirmed by the histopathological examination. She later underwent an image-guided craniotomy and total resection of the tumour.

Immediately following surgery, the patient developed a complete paraparesis along with dysesthesia of the lower limbs. Nonetheless, the seizure episodes have stopped occurring. Two days post resection; brain computed tomography (CT) with contrast was performed and showed presence of a deep bifrontal white matter oedema. The patient was managed conservatively and was enrolled in an intensive neurorehabilitation program. She had six weeks of inpatient rehabilitation which consists of two to three hours of therapy sessions daily followed by eight weeks of weekly outpatient therapy. A program tailored to her motor and sensory problems included therapeutic exercises, mobility training, functional activities training, use of physical modalities and prescription of bilateral ankle foot orthosis.

A baseline assessment of the patient's motor power and functional status was performed at admission into the rehabilitation unit using Medical Research Council (MRC) grading and Karnofsky Performance Scale (KPS) respectively. Progress was monitored and scored periodically throughout the program. A repeat MRI was performed at four month after surgery which showed a parasagittal extra axial mass near the vertex measuring 1.2 cm x 1.2 cm x 2.3 cm, consistent with residual meningioma (Figure 2). Since the patient was showing improvement and did not have any further complications, surgical intervention was not undertaken.

The patient showed remarkable neurological recovery with resolution of the dysesthesia over a period of one year. However, there were some residual motor weaknesses persist but she has gradually improved from ambulating using a wheelchair to walking independently without gait aid. Table I shows the improvement in her lower limb motor power during the rehabilitation program up to her follow up at one year. Her KPS score had improved from 40% at baseline to 90% at one year.

DISCUSSION

Significant morbidity can result from surgical removal of parasagittal meningioma invading the SSS due to the possible complications of brain oedema and venous infarction.

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Table I : Summary of patient's lower limb motor power improvement during neurorehabilitation program up to 1 year follow up (according to Medical Research Council (MRC) grading)

Duration after post surgical resection	Lower Limb Motor Power			
	Right		Left	
Day 1	All muscles	0	All muscles	0
3 weeks	Hip ext	1	Hip ext	1
	Hip flex	1	Hip flex	1
	Knee ext	1	Knee ext	1
	Knee flex	0	Knee flex	0
	Ankle PF	0	Ankle PF	0
	Ankle DF	0	Ankle PF	0
6 weeks	Hip ext	3	Hip ext	4
(end of inpatient	Hip flex	3	Hip flex	3
rehabilitation program)	Knee ext	4	Knee ext	4
	Knee flex	3	Knee flex	4
	Ankle PF	1	Ankle PF	1
	Ankle DF	1	Ankle DF	1
4 months	Hip ext	5	Hip ext	5
(end of outpatient	Hip flex	5	Hip flex	5
rehabilitation program)	Knee ext	5	Knee ext.	5
	Knee flex	4	Knee flex	5
	Ankle PF	2	Ankle PF	2
	Ankle DF	1	Ankle DF	2
1 year	Hip ext.	5	Hip ext.	5
(at rehabilitation clinic	Hip flex	5	Hip flex	5
follow up)	Knee ext.	5	Knee ext	5
	Knee flex	5	Knee flex	5
	Ankle PF	5	Ankle PF	5
	Ankle DF	3	Ankle DF	3

Table I (Legend)
Ext – extension
Flex – flexion
PF – plantar flexion
DF – dorsiflexion

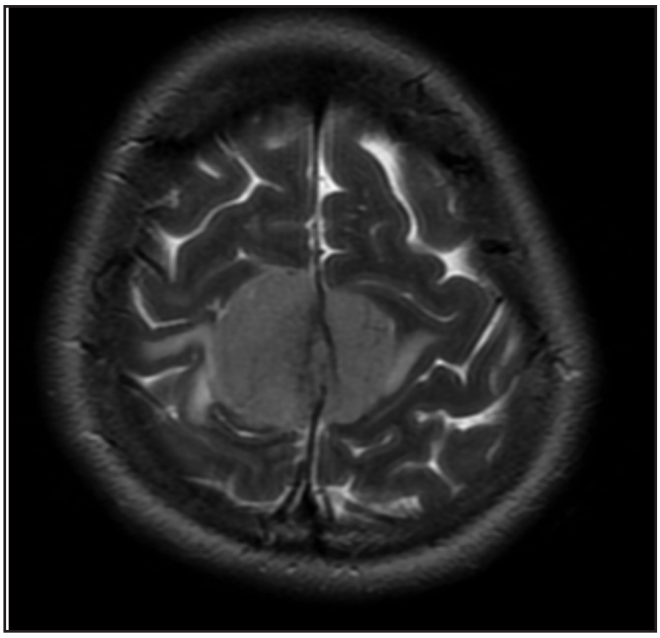

Fig. 1: MRI Brain (T2 image).

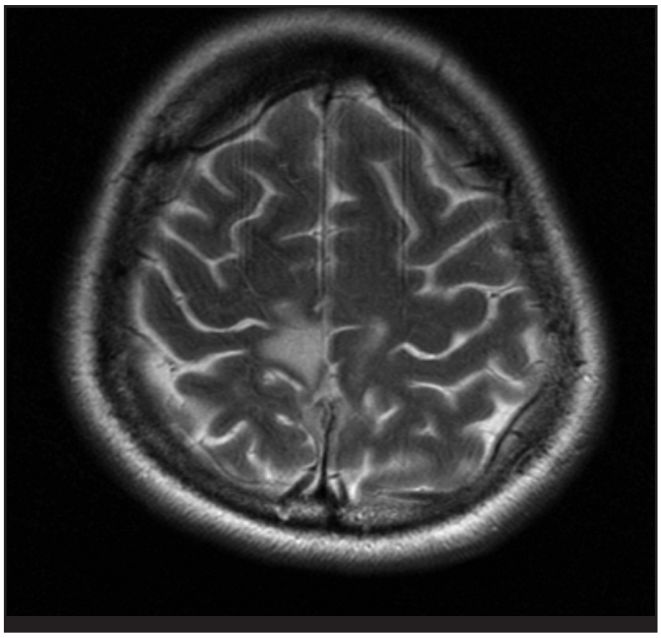

Fig. 2: MRI Brain (T2 image) – 4 months, post tumour resection.

Monoparesis, tetraparesis and paraparesis are among the motor dysfunctions that were reported occurring postoperatively[1]. An immediate post operative neurologic worsening is not uncommon. In previous reports, neurologic deterioration can either be transient, with recovery within a few days or weeks; or it can be permanent[1,3].

Our patient developed a complete paraparesis immediately post resection of the parasagittal meningioma which invaded the middle third of SSS. This is accompanied by dysesthesia of both her lower limbs. Restoring motor function and improving level of independence were among the main concerns after the acute phase of surgery. Admittance into the neurorehabilitation unit for an early and structured program has been beneficial. She showed marked improvement from severe disability to minor disability over one year period.

Rehabilitation outcome in patients with intracranial meningiomas was found to be comparable with that of stroke when they were admitted to rehabilitation treatment early after meningioma excision[4]. DiMeco *et al* reported that almost 30% of their patients needed inpatient neurorehabilitation care after surgery and resulted with better functional outcome[3].

This case report highlights the serious neurological deficits experienced by our patient after resection of a parasagittal meningioma invading the SSS. The involvement of local brain oedema was suggested for the immediate neurological worsening postoperatively. We believe that the resolution of brain oedema acts as a mechanism of natural neurological recovery, together with possible rearrangement of venous anastomoses and opening of alternative venous outflow pathways[3]. We emphasize on the role of an early intensive neurorehabilitation program to ultimately improve the patient's functional outcome on the long term.

Studies have shown that neurological and functional recovery in response to rehabilitation is consistent with brain neuroplasticity evidenced from functional MRI (fMRI) and transcranial magnetic stimulation[5]. Such recovery can also be monitored clinically using various outcome measures. In this case report, we used MRC and KPS to document both neurological and functional recoveries respectively. We believe the clinical assessments are a useful complement to the routine use of fMRI and electrophysiology to monitor brain plasticity following neurorehabilitation.

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