Early rehabilitation results of patients with thalamic tumor and thalamic hemorrhage

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Thalamic lesions cause significant impairments in the central nervous system (CNS), since the thalamus is an important regulation and integration center of all afferent stimuli to the CNS and because of its location. Thalamic lesions usually occur due to tumors and vascular diseases.[1] Thalamic hemorrhages form 5% of spontaneous brain hemorrhages and thalamic tumors form 1% of intracranial tumors.[2] In the literature, rehabilitation results of patients with thalamic lesions are limited. However, it may be useful to investigate the rehabilitation results of patients with thalamic tumor and hemorrhage in order to determine longer-term rehabilitation strategies and to generate expectations about these groups of patients by comparing the results. Therefore, this study was planned to investigate and compare the early rehabilitation results of patients with hemiparesis due to thalamic tumors and thalamic hemorrhages and to compare the results.

The rehabilitation results from 38 hemiparetic patients consisting of 20 patients with thalamic tumor (average age was 47.60 ± 17.86 years) and 18 patients with thalamic hemorrhage (average age was 48.50 ± 17.17 years) in the Hacettepe University School of Physical Therapy and Rehabilitation, Neurosurgery Unit between the years 1992 and 2004 were investigated and compared. One of the inclusion criteria was clinical stability. The Glasgow coma scale (GCS) was used to determine the level of consciousness and to create homogeneous groups. Subjects who had 13-15 points out of 15 (mild coma)[3] were included in the study. The GCS scores of the patients with thalamic tumor and thalamic hemorrhage are 14.42 ± 0.55, and 14.33 ± 0.82. Radiation therapy has some adverse effects such as vomiting, nausea, and fatigue. It was thought that these adverse effects might influence the rehabilitation results and so the patients who were undergoing radiation therapy during the rehabilitation program were not included. The tumor types were glioblastoma multiforme (6), pilocytic astrocytomas (3), and anaplastic astrocytoma (11). Hemorrhage was due to aneurysm in 6 patients, arteriovenous malformation (AVM) in 3 and hypertension (HT) in 9. In the thalamic tumor group, 8 patients had subtotal and 12 had gross total tumor excision. Eight patients with thalamic hemorrhage underwent surgery, and medical treatment was given to the remaining subjects of this group. The rehabilitation program was initiated as soon as the patients were referred by their neurosurgeons. This was approximately 1-2 days after hospitalization or surgery. Rehabilitation was applied 5 days a week for 19.6±6 sessions for the patients with thalamic tumor, and 20.4±3.65 sessions for those with thalamic hemorrhage. The subjects were transferred to other rehabilitation centers after discharge from the hospital, since our department is an acute care department. The pre-rehabilitation evaluation parameters were the Karnofsky Performance Scale[4] (100-0%) (for functional impairment and quality of life), the Mokken Scale[5] (0-3) (for functional activities and balance in sitting and standing positions), and the Canadian Neurological Stroke Scale[3] (1.5–1.0–0.5–0.0) (for motor function). These evaluations were repeated after the rehabilitation program. Sensation impairments could not be determined because the patients were not able to communicate adequately. The rehabilitation program used in both groups was composed of neurophysiological approaches containing extremity exercises, mat activities, transfer activities, sitting, standing, walking and stair activities by following the normal motor development cycle.[6] Pre-rehabilitation and post-rehabilitation evaluation results were compared using the Wilcoxon signed ranks test. In addition, the groups were compared by Mann-Whitney U test. The SPSS for Windows 11.0 was used for the statistical analysis. The level of significance was set at $p<0.05$.

Mean ages and the level of consciousness, which was determined by the GCS, of the groups were similar ($p>0.05$). The results indicated that the evaluated parameters were significantly better in both groups after the rehabilitation program ($p<0.05$), except for balance when standing on the affected leg and stair activities ($p>0.05$) (**Table 1**). Improvement amounts of the evaluated parameters were found similar in both groups ($p>0.05$).

The thalamus is an important center with regulation and integration functions, and so lesions to it cause significant impairments of the CNS.[1] Thalamic lesions usually occur due to tumor involvement and vascular diseases that cause degeneration and hemorrhage. Sensorial impairments, coma, communication disabilities, personality changes or mental deterioration, including memory loss, inattention, confusion, hallucinations, or slow mentation and extended motor impairments are common in thalamic lesions.[1] All patients in this study were in coma and had confusion and hemiparesis at the beginning of the rehabilitation program. According to the literature, 60-100% of thalamic hemorrhages are due to HT.[2] In our study, the subjects with thalamic hemorrhage were all hypertensive. The causes of hemorrhages were AVM in 3/18 of the patients, aneurysm in 6/18 and only HT in 9/18. One series of 43 tumors in the thalamus included 15 astrocytomas, 13 glioblastomas, and 15 pilocytic astrocytomas. Approximately half of

Table 1 - Intragroup analysis of the evaluated parameters.

Parameters	Thalamic tumor			Thalamic hemorrhage		
	Pre-Rehabilitation (Mean ± SD)	**Post-Rehabilitation (Mean ± SD)**	***p***	**Pre-Rehabilitation (Mean ± SD)**	**Post-Rehabilitation (Mean ± SD)**	***p***
Karnofsky performance scale	40.00 ± 7.07	56.00 ± 8.94	0.038	-	-	-
Functional activities (Mokken scale)						
Rolling in bed	2.20 ± 0.84	0.20 ± 0.45	0.039	2.33 ± 0.82	0.33 ± 0.52	0.024
Sitting in bed	2.40 ± 0.89	0.80 ± 0.84	0.038	2.83 ± 0.41	1.00 ± 0.89	0.026
Gait	2.80 ± 0.45	1.40 ± 0.89	0.038	3.00 ± 0.00	2.00 ± 0.00	0.014
Stair activities	2.80 ± 0.45	2.00 ± 1.00	0.102*	3.00 ± 0.00	2.50 ± 0.55	0.083*
Balance impairment (BI) (Mokken scale)						
BI Sitting	2.20 ± 1.30	0.60 ± 0.55	0.046	2.50 ± 0.55	0.50 ± 0.55	0.024
BI Standing	2.60 ± 0.89	1.40 ± 0.89	0.034	3.00 ± 0.00	1.67 ± 0.52	0.023
BI Intact foot	2.40 ± 0.89	1.40 ± 0.89	0.025	3.00 ± 0.00	2.00 ± 0.63	0.034
BI Affected foot	2.80 ± 0.45	2.20 ± 1.30	0.180*	3.00 ± 0.00	2.83 ± 0.41	0.317*
Canadian neurological stroke scale (Motor function)						
Proximal arm	0.40 ± 0.42	1.10 ± 0.42	0.038	0.33 ± 0.26	0.92 ± 0.20	0.020
Distal arm	0.20 ± 0.27	0.70 ± 0.57	0.034	0.17 ± 0.26	0.58 ± 0.38	0.025
Proximal leg	0.50 ± 0.32	1.17 ± 0.26	0.038	0.50 ± 0.32	1.17 ± 0.59	0.038
Distal leg	0.30 ± 0.27	0.80 ± 0.57	0.039	0.17 ± 0.26	0.67 ± 0.41	0.034

*p>0.05 (Wilcoxon signed rank test)

such thalamic tumors probably fall into the category of anaplastic astrocytoma.[2] In our study, among the 20 cases, 6 involved glioblastoma multiforme, 3 involved pilocytic astrocytomas, and 11 involved anaplastic astrocytoma. It should be taken into consideration that in our Neurosurgery unit only acute phase rehabilitation is available; patients are subsequently transferred to other rehabilitation centers. Therefore, long-term rehabilitation results could not be documented. This may be a limitation of our study. In such cases, long-term follow-up trials are required. In this study, all functional activities except for stair activities and balance while standing on the affected leg were significantly improved after the rehabilitation program. Motor function of the arm and leg as assessed by the Canadian Neurological (Stroke) Scale, and performance according to the Karnofsky performance scale was also improved. The reason for not achieving significant improvements in some of the functional and balance activities may be the short duration of the rehabilitation program, since improvements in these activities are achieved at later stages of rehabilitation.[6]

Rehabilitation seems to promote functional improvements in thalamic tumor and hemorrhage. This effect may not be only due to the rehabilitation, but also due to the decompression effect of the applied medical or surgical methods. The results of this study show that early rehabilitation in addition to medical treatment is important for decreasing morbidity in hemiparetic patients with thalamic hemorrhage and tumor. Regardless of the reason for the lesion, rehabilitation should be initiated as early as possible, before functional impairments become chronic. Especially in highly malignant tumors, it is important to achieve functional gains and so minimize the expected loss due to deterioration. Since morbidity decreased and no extra complications existed during the rehabilitation program, it is important to focus on rehabilitation approaches, with longer follow-up periods and on more patients.

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