Tension

The partial pressure of oxygen in arterial blood; arterial oxygen concentration, or tension; usually expressed in millimeters of mercury (mm Hg).

A burr hole opening with closed system drainage was performed on 124 chronic subdural hematomas (CSDHs) in 102 patients of the Department of Neurosurgery, Teikyo University Hospital Mizonokuchi, Futago, Takatsu-ku, Kawasaki, Kanagawa, Department of Neurosurgery, Teikyo University Medical School, Kaga, Iabashi-ku, Tokyo Japan, Department of Neurosurgery, Loma Linda University Medical Center, California USA. Hematoma thickness and midline shift were measured by computed tomography scan and hematoma pressure was measured with glass manometers in surgery. In accordance with Laplace's law, tension on the motor cortex was calculated as (half the hematoma thickness × hematoma pressure)/2. Student's t-test and Pearson value (r: relationship index) were applied in statistical analysis of findings.

Motor weakness was identified in 76.5% of our cases, and severity of hemiparesis showed no correlation with age. Tension was strongly related to hemiparesis ($r = -0.747$, $p<0.01$), whereas hematoma thickness ($r = -0.458$, $p<0.01$) and pressure ($r = -0.596$, $p<0.01$) were moderately correlated with hemiparesis. Fourteen patients (13.7%) complained of headache and mean age of these patients was much younger than those without headache ($p<0.01$). Stronger midline-shift ($p<0.01$) and greater ratio of midline-sift to hematoma thickness ($p<0.01$) were statistically correlated with headache. Recurrence of CSDH was recognized in eight patients (7.8%). Seven of them had no further recurrence after a second surgery and one patient required a third surgery. Stronger midline-shift ($p<0.05$) and greater ratio of midline-shift to hematoma thickness ($p<0.05$) were statistically associated with recurrence, although hematoma thickness, pressure, and tension were not correlated with recurrence.

Tension is the most influencing factor to development of hemiparesis in patients with CSDH, showing that thick hematoma causes mild motor weakness if the hematoma pressure is low. This study also elucidates the mechanism for quick recovery from hemiparesis after burr-hole surgery in that tension on the motor cortex is decreased immediately by drainage although the subdural space remains wide. However, high tension to the brain cortex was not correlated with either headache or recurrence of CSDH [1].

1)
Tomita Y, Yamada SM, Yamada S, Matsuno A. Subdural tension on the brain in chronic subdural hematoma patients is related to hemiparesis, but not to headache or recurrence. World Neurosurg. 2018 Jul 31. pii: S1878-8750(18)31670-X. doi: 10.1016/j.wneu.2018.07.192. [Epub ahead of print] PubMed PMID: 30075268.