Analytical morphomics is the term created by Rinkinen et al., to describe an innovative, highly automated, anatomically indexed processing of 3D medical imaging data captured during the course of a patients' preoperative CT scan.The aim is to determine the efficacy of craniofacial morphomic indices (CMI) such as temporalis muscle and temporal fat pad morphometric values to predict blood transfusion requirement and hospital stay in a cohort of children with nonsyndromic craniosynostosis (NSC).

High-throughput, semi-automated image analysis was used to reconstruct the 3-dimensional anatomy of the temporalis muscle and temporal fat pad and to quantify CMIs. The prognostic effect of CMI on clinical outcomes were evaluated among all NSC patients and compared across various craniosynostosis subtypes using Wilcoxon nonparametric tests and Kendall's τ to determine significance.

Using preoperative CT images, we evaluated 117 children with NSC from the University of Michigan Health System. Results demonstrate that increased temporal fat pad volume and local temporalis muscle volume are associated with better clinical outcomes in craniosynostosis patients. More specifically, temporal fat pad volume was shown to be a significant predictor of perioperative blood transfusion requirements ($P = 0.0033$) and increased temporal muscle volume correlated with decreased hospital stay ($P = 0.016$) when controlling for other covariates including age, sex, weight, and preoperative hematocrit. In addition, the same significant predictors were found when examining individual subtypes of craniosynostosis. CONCLUSION:

Our findings demonstrate that maxillofacial CT scans provide a useful quantitative index reflecting general patient health, risk stratification, and probabilities of intervention in addition to their previously established ability to determine the specific pathology of the patient. We demonstrate that temporal morphomics predict the incidence of blood transfusion, hospital stay, and serve as a proxy for fitness in patients undergoing craniosynostosis surgery [1].

1)
Rinkinen J, Zhang P, Wang L, Enchakalody B, Terjimanian M, Holcomb S, Wang SC, Buchman SR, Levi B. Novel temporalis muscle and fat pad morphomic analyses aids preoperative risk evaluation and outcome assessment in nonsyndromic craniosynostosis. J Craniofac Surg. 2013 Jan;24(1):250-5. doi: 10.1097/SCS.0b013e31827006f5. PubMed PMID: 23348295.