2177 Corticomotor map of the human masseter: Effect of motor task.

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Previously, we have mapped the corticomotor representation of the human masseter muscle using transcranial magnetic stimulation (TMS). The aim of this study was to determine the effect of motor task on descending motor control to the masseter by measuring putative changes in the motor map according to task. Subjects' (n=7) heads were fixed in a customized plastic mask. A 1 cm^2 grid system was marked on the mask over the left hemisphere. TMS was performed at verified sites on the mask using a figure eight coil manipulated by a stereotactic system. Threshold (T) for the motor area was calculated. Loci on the grid were stimulated at T+10% whilst subjects clenched in the intercuspal position (*ICC*), on the incisors (*IncC*), and on the left molar teeth (*LM*). EMG activity during each task was maintained at a preset level (*ICC*, 10 % MVC), using biofeedback. Motor evoked potentials (MEP) [n=30] were recorded in the right masseter *using surface electrodes. MEPs for each task were averaged and latencies/amplitudes* associated with individual loci calculated, then the total area, volume and average height of the maps computed. Data were analysed using ANOVA. The total area/volume/average height of the maps were 10(1.5) cm^2/ 2.2(1.0) cm^2 x mV/ 0.18(0.05) mV for *ICC*, 7.7(0.9)/ 1.1(0.2)/ 0.14(0.02) for *IncC*, and 9.3(1.6)/ 2.0(1.0)/ 0.18 (0.04) for *LM* tasks. There were significant differences in map area, volume and height according to task ($p<0.0001$). The data provide evidence of task-related modulation of corticobulbar activity. The observations suggest that masseter MEPs, evoked by TMS, are influenced by the level of cortical excitability.

2178 *Talking and Eating: How the hyoid complex accomodates both activities.* KM HIIEMAE*, JB PALMER[1], SW MEDICIS, BS JACKSON and J HEGENER. Institute for Sensory Research, Syracuse University, NY 13244 and [1]Physical Medicine and Rehabilitation, Johns Hopkins University, Baltimore, MD 31210.

The hyoid moves continuously during feeding: the area in which it moves migrating upwards and forwards as the feeding sequence progresses (Hegener et al., 1998). Hyoid movement in speech has not been examined but models of the acoustical parameters for speech (Lieberman et al., 1992) demand a roughly equivalent volume of air in the oropharynx and oral cavity which can be modulated by tongue and soft palate movement. How this might be achieved has long been argued. A possible mechanism might be for the hyoid, if it moves in speech, to do so in 2D space anterior to that used in feeding.To test this hypothesis, the spatial domain of the hyoid (XY plots relative to the upper occlusal plane) were obtained from 8 normal human subjects (4 each sex) for lateral projection videofluorographic records of feeding (soft and hard foods) and for speech (the 'Grandfather Passage' used in diagnostic tests for speech competence). Videotapes were digitised and analysed (see Palmer et al., 1997).The hyoid moves continuously. XY plots of hyoid and jaw movement for speech (+ 3000 datapoints) and feeding (all foods, + 2500 datapoints) relative to the upper occlusal plane were plotted. Hyoid domains in *speech were anterior to those in feeding with small overlap. To test the null hypothesis (domains* statistically the same), the test for difference between the means for two bivariate (two-dimensional) populations (Hald, 1965) was used. The hypothesis was rejected, p values for the difference in the means were highly significant: $p < 0.0001$ for all cases. We conclude that the pattern of activity in the muscles of the hyoid complex must change between feeding and speech, to allow for the anterior spatial domain used in speech which produces an antero-posteriorly widened oropharynx. However, based on the (rare) occurrence of 'dry swallows' during speech, which occurred in the same spatial domain as normal feeding swallows, we also conclude that near instantaneous transitions between the two functional domains occur in normal behavior. Supported by USPHS NIH NINCD 02123

2179 How Mastication affects Respiration. T ARVAS*, KM HIIEMAE, JB PALMER[1], L MIOCHE[2]. Bioengineering and Neuroscience, Syracuse University, Syracuse, NY; [1]Physical Medicine and Rehabilitation, Johns Hopkins University, Baltimore MD,[2]also INRA, Clermond-Ferrand, France.

When feeding on solid foods, the bolus forms in the oropharynx and accumulates over several seconds depending on the food type (Hiiemae & Palmer, *in press*).What is the pattern of respiration associated with masticatory activity before swallow? Fontana et al. (1992) found respiratory rhythm increased when chewing gum. 'Irregularity' when eating donuts is reported (Smith et al.,1989). A pilot study (five subjects, 3 female, 2 male) tested the hypothesis that chewing would impact respiratory rhythm. Subjects with a nasal cannula connected to a pressure transducer (Gaeltec, Skye, Scotland) and surface electrodes (Masseter EMG) on the left side, were asked to breathe normally for 30s, then to consume 8g of hard cookie (Walker's Shortbread, Scotland).Three records (a) control; b) 2 with VFG were obtained. Air pressure and EMG data were acquired in Labview (National Instruments, Austin, TX), and analysed with Dadisp (DSP, Cambridge, MA). VFG tapes were analysed using slow-motion and stop-frame VCR functions. Air pressures were examined at rest and compared with chewing. Overall, there was much less variation in the number and duration of chewing cycles between subjects than in respiratory cycles. 'Resting' respiratory patterns are so changed in feeding that conventional measures (Fontana et al.1992) could not be used. Using maximum 'inhalation' as the criterion for the start of each cycle, we found the irregularity was linked to either a) 2-fold increase in 'cycle duration', or b) a disruption in the periodicity of the cycle, reflected by an SD 30-50% of the mean time elapsed between maxima for inhalation, and/or c) a suppression of full expiratory excursions for long periods with no or very small positive pressures. We also find high frequency oscillations in nasal air pressure associated with each burst of masseter activity. We conclude that chewing 'normal' foods has a dramatic effect on respiratory rhythm and intranasal air pressures.
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2180 The Functional Geometry of the Linkage between Mandible and Hyoid in Man. SW MEDICIS*, JB PALMER [1], and KM HIIEMAE. Bioengineering and Neuroscience, Syracuse University, Syracuse NY 13244 and [1]Physical Medicine and Rehabilitation, *The Johns Hopkins University, Baltimore, MD 31210*

Mylohyoid, geniohyoid and digastric connect the mandible and hyoid. In non-human mammals the hyoid is positioned behind, not below the mandible as in man. It is in continuous motion during feeding, as well as during human speech. Previous studies (McGarrick and Thexton, 1978; Hiiemae et al., 1981) assumed that a mandibular reference plane 'isolated' hyoid movement from jaw movement effects. The question then arises: does jaw position affect measured hyoid position in man? To test a model for jaw-hyoid relationships in man (Baba et al., 1998), data from digitized lateral projection videofluorographic records of 8 normal subjects feeding on soft and hard foods and reading the 'Grandfather Passage' (a diagnostic text for speech) were used. Cartesian coordinates for datapoints *(lower canine, hyoid) were trigonometrically manipulated in Microsoft Excel to establish instantaneous* position in the X-axis (parallel to the upper and lower reference planes) and in the Y-axis (perpendicular to the reference planes). The model predicts that when the jaws are closed (i.e.upper$^{(c)}$ and lower reference$^{(o)}$ planes are parallel), the values of hyoid X and Y relative to both will be the same (i.e. HUY and HUX = HLY and HLX, where HU refers to the upper occlusal plane and HL the lower). When jaw opening and hyoid movement are modelled, values will change such that $HLX^c > HLX^o$ and $HLY^c > HLY^o$. Values for hyoid X,Y and lower canine X,Y for all records for feeding and for speech were plotted and the correlation coefficients obtained. R^2 values for all records showed that the effect of jaw movement on hyoid position was greatest in feeding for both hyoid X and Y relative to the upper occlusal plane, but conversely, lower relative to the lower occlusal plane in speech. We conclude a) that the amplitude of jaw movement (lower in speech) affects but does not govern hyoid position, and b) the anterior suprahyoid muscles have a primary role in regulating hyoid movement.
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2181 The effect of jaw biomechanics and muscle volume on biting performance. Y.Y. Shiau*, C.C. Peng, and C.W. Hsu. (School of Dentistry, National Taiwan University, Taipei, Taiwan).

Bite force has been related to the jaw biomechanics and the health of the masticatory system. Our previous studies suggested that the masseter muscle size is negatively related to the bite performance on the time used to beak a known hardness of testfoods. The present study included both cephalometric measurements and muscle size on the evaluation of bite performance. Twenty six male students (age:20~26 yrs) having complete and sound dentition, class I jaw relation and no TMD were observed. Masseter muscle volume was estimated from axial MR images of the head. Cephalometric x-ray was taken and measurements on some important lines, angles and ratios were obtained. The subjects were asked to bite through a standardized testfood of 20, 40, and 80kg hardness with random sequence while the masseter muscle EMG and jaw position were recorded. Statistic analysis using the principle of general estimated equation and multiple regression suggested a significant influence of craniofacial form and muscle volume on the bite performance, and the difference of hardness affected mainly on the duration of muscle contraction. The exertion of bite force could be affected by experience of previous harder food breaking. It was concluded that the MRI muscle volume measurement and standardized testfood preparation are important observation modalities, and the bite performance is not only related to the biomechanics of the jaw and muscles. (Supported by NSC 87-2314-B002-129)

2182 Psychological Sequelae of Maxillofacial Trauma. J P SHEPHERD*[1], J I BISSON[2] and M DHUTIA[1]. ([1]Departments of Oral and Maxillofacial Surgery and [2]Psychological Medicine, U WCM, Cardiff, UK).

Facial trauma can have distressing psychological sequelae (Bisson and Shepherd, Br J Psychiat 1995;167:718-20). Since it was not clear whether this is recognised in clinical practice and what was the prevalence of post traumatic stress disorder following facial trauma, these problems were investigated. References to mental state in case records (retrospective random sample of 50 patients) were collated. A further sample of 66 patients with maxillofacial fracture or facial laceration >2cms were subject, prospectively, to a battery of psychiatric (Impact of Event Scale: IES, Hospital Anxiety and Depression Scale: HADS, Post Traumatic Stress Disorder Symptom Scale: PSS) and trauma scales (Injury Severity Score: ISS and predictors for PTSD: psychiatric and trauma history, employment status, perceived seriousness, blame attribution and demographic variables) on presentation and at seven weeks. References to mental state were infrequent (16%), cursory and generated no referrals to mental health professionals. Interns' assessments of future psychological impact were correlated to HADS scores ($p=0.008$) and IES ($p=0.001$). 27% patients developed PTSD. Previous psychiatric history, assault and fracture were significantly linked to PTSD, but not gender or injury severity (Mean ISS=2, Range=1-9). Documentation of psychological sequelae needs to be improved. One quarter of patients with maxillofacial trauma developed PTSD: this could be predicted by interns.

2183 Randomized Trial of an Alcohol Intervention to Prevent Injury. A.SMITH*' J.P.SHEPHERD[1] & R.HODGSON[2] (Departments of Oral Surgery & [2]Applied *Public Health Medicine, UWCM, Cardiff, UK).*

Previous studies have demonstrated that brief psychological interventions for harmful/hazardous alcohol consumption have yielded promising results in some medical settings. The aim of this study was to evaluate the effectiveness of a brief intervention designed to reduce binge alcohol consumption and subsequent injury in young males. *The study was a randomized controlled trial involving 151 patients with maxillofacial* trauma who were aged between 16 and 35 years of age and had consumed a minimum of 8 units of alcohol in the six hours prior to injury. Following an assessment interview, patients were randomly allocated to either the intervention or control group. Both groups completed a battery of questionnaires including measures of alcohol and drug use, social satisfaction and perceived causes of injury. In addition the treatment group received a brief (15 minute) motivational enhancement intervention from a specially trained nurse in an oral and maxillofacial surgery clinic. Mean total alcohol consumption for the three month periods pre and post intervention (120 participants) dropped from 345 to 335 units for the control group and from 409 to 300 units for the intervention group. A repeated measures ANOVA indicated a time by treatment effect for alcohol consumption of $F=5.7$, $df = 1$ significant at $p< 019$. This indicates a significant treatment effect in terms of reduced alcohol consumption at three month follow up.

2184 Effect of Closed Circuit Television on Urban Violence. V SIVARAJASINGAM*, J P SHEPHERD. (Department of Oral Surgery, Medicine and Pathology, UWCM, Cardiff, UK).

Violence has become the major cause of maxillofacial fractures in the UK and an important public health problem in both UK and US. The impact of city centre closed circuit television (CCTV) on recorded assault was investigated prospectively in the year before and year after CCTV installation from the police and Accident and Emergency Department (AED) perspective in three centres in Wales. Data were compared to two main measure of violence in Wales, British Crime Survey (BCS) and official police crime statistics. Overall, CCTV installation was associated with a 3% reduction (6333 to 6167) in numbers of assaults recorded by AEDs and a 15% reduction (889 to 752) in assaults recorded by the police. There was no evidence of the differential temporal effects which have been reported in relation to property crime. Substantially greater numbers of assaults were recorded by the AEDs than the police. Set against a background of steadily increasing violence in Wales (18% increase: police crime data 1994-6) and England and Wales (17% increase: BCS 1993-5), the results of this study suggest that CCTV installation reduced town/centre violence. The installation of city centre CCTV was associated with reduction in assaults in these three centres.