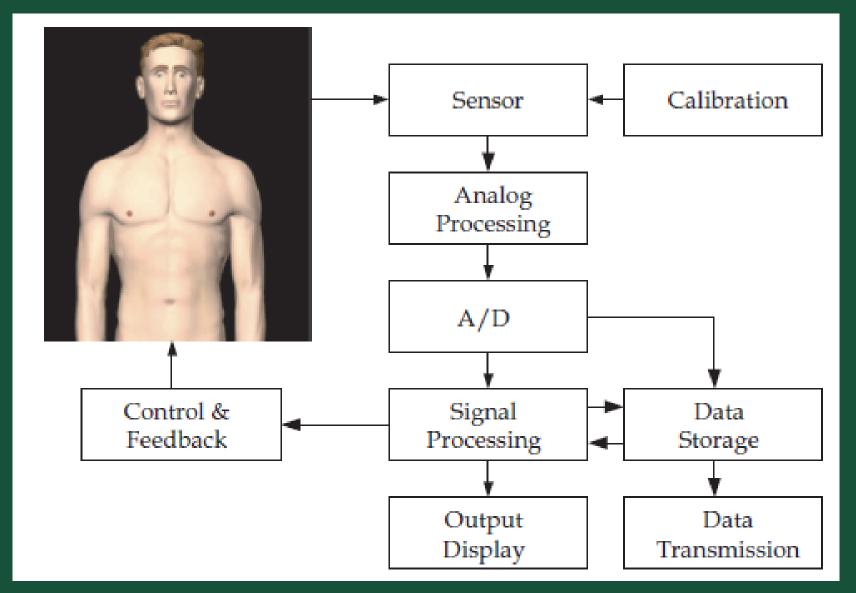
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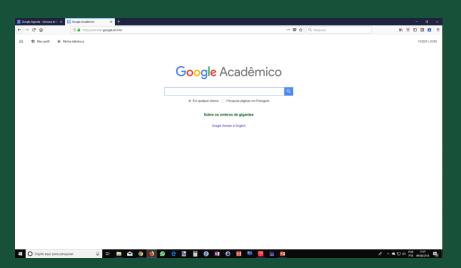
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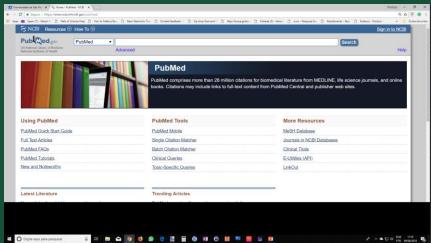


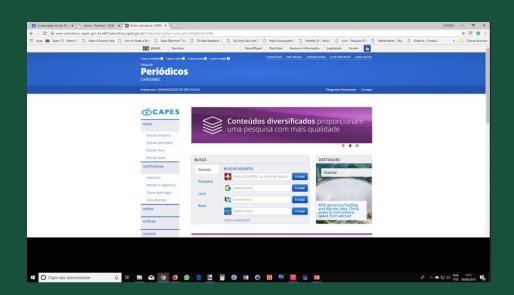
SISTEMA DE INSTRUMENTAÇÃO BIOMÉDICA



Qual efeito fisiológico queremos medir?







Original Research Sleep Disorders



Different Craniofacial Characteristics Predict Upper Airway Collapsibility in Japanese-Brazilian and White Men



Fabiola Schorr, MD; Fabiane Kayamori, PT; Raquel P. Hirata, PT; Naury J. Danzi-Soares, RN; Eloisa M. Gebrim, MD; Henrique T. Moriya, PhD; Atul Malhotra, MD; Geraldo Lorenzi-Filho, MD; and Pedro R. Genta, MD

BACKGROUND: OSA pathogenesis is complex and may vary according to ethnicity. The anatomic component predisposing to OSA is the result of the interaction between bony structure and upper airway soft tissues and can be assessed using passive critical closing pressure (Pcrit). We hypothesized that Japanese-Brazilians and whites present different predictors of upper airway collapsibility, suggesting different causal pathways to developing OSA in these two groups.

METHODS: Male Japanese-Brazilians (n = 39) and whites (n = 39) matched for age and OSA severity were evaluated by full polysomnography, Pcrit, and upper airway and abdomen CT scans for determination of upper airway anatomy and abdominal fat, respectively.

RESULTS: Pcrit was similar between the Japanese-Brazilians and the whites $(-1.0\pm3.3~{\rm cm}~{\rm H_2O}~{\rm vs}~-0.4\pm3.1~{\rm cm}~{\rm H_2O}, P=.325)$. The Japanese-Brazilians presented smaller upper airway bony dimensions (cranial base, maxillary, and mandibular lengths), whereas the whites presented larger upper airway soft tissue (tongue length and volume) and a greater imbalance between tongue and mandible (tongue/mandibular volume ratio). The cranial base angle was associated with Pcrit only among the Japanese-Brazilians (r=-0.535, P<.01). The tongue/mandibular volume ratio was associated with Pcrit only among the whites (r=0.460, P<.01). Obesity-related variables (visceral fat, BMI, and neck and waist circumferences) showed a similar correlation with Pcrit in the Japanese-Brazilians and the whites.

CONCLUSIONS: Japanese-Brazilians and whites present different predictors of upper airway collapsibility. Although craniofacial bony restriction influenced Pcrit only in the Japanese-Brazilians, an anatomic imbalance between tongue and mandible volume influenced Pcrit among the whites. These findings may have therapeutic implications regarding how to improve the anatomic predisposition to OSA across ethnicities.

CHEST 2016; 149(3):737-746

KEY WORDS: computed tomography; Pcrit; ethnicity; OSA

ABBREVIATIONS: AHI = apnea-hypopnea index; MPH = distance from the hyoid to the mandibular plane; Pcrit = passive critical closing pressure; PSG = polysomnography; TV/MV = tongue/mandibular volume; Vimax = peak inspiratory flow

AFFILIATIONS: From the Sleep Laboratory (Drs Schorr, Lorenzi-Filho, and Genta and Mss Kayamori, Hirata, and Danzi-Scares), Pulmonary Division, Heart Institute (InCor), and the Radiology Institute (InRad) (Dr Gebrim), Hospital das Clinicas, University of São Paulo School of Medicine, São Paul, Brazil; the Biomedical Engineering Laboratory (Dr Moriya), University of São Paulo, São Paulo, Brazil; and the Department of Pulmonary and Critical Care Medicine (Dr Malhotra), University of California San Diego, La Jolla, CA.

FUNDING/SUPPORT: This study was supported by the Fundação de Amparo à Pesquisa do Estado de São Paulo (FAPESP) and NIH

CORRESPONDENCE TO: Pedro R. Genta, MD, Sleep Laboratory, Pulmonary Division, Heart Institute (InCor), University of São Paulo School of Medicine, Av. Dr. Enéas de Carvalho Aguiar, 44, São Paulo, Brazil; e-mail: prgenta@gmail.com

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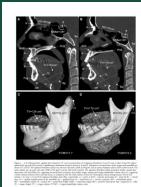
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OSA is a common disorder arming adults that is defined. and graded by severity by the agrees hypopana index (AHD). The reachamness that lead to OSA are complex and not completely understood. The balance between the crossoficial beary structure and the apper strong self, therees in thought to determine an unatomic predisposition to OSA," Obesity may modify the upper sirvey through the exlargement of the apper sirvey soft. tasses, opecially the torque." Several other factors, including neuroesuscular modulation, control of bouthing, and around throshold, may contribute to OSA awarity as expressed by AHL.11 All these factors may interact differently according to sex, age, and efinicity. Because of the differences in craminfacial characteristics. and body composition among ethnicities, interefficic studies provide an attractive model for studying the angrossic component of CSA pathogenesis. Asians are thought to be predisposed to OSA because of cramoficial hore restriction. Asians with OSA have been shown to have a shorter cranial base length than doeditor. In contrast, whites have been slicture to have larger upper nirway self tissue, such as infarged longue directions, when compared with Asians. Despite all

there differences, OSA prevalence is strikingly similar in Asian and Western countries. 1-21.15

Several issues may have limited our understanding of the ethnic differences in OSA. Some intenthnic studies included only people with OSA and may have not been able to characterise the full spectrum of the differences among ethnicities. In addition, most studies were controlled by fiMI or AHL "" 1041 may not be a good matric to compare of nicities because of ethnic differences in body composition. 14.15 AHI cannot distinguish between austomic predisposition. and the other factors that lead to OSA. The passive critical closing pressure (Porit) can assess anatomic prodisposition to OSA. With a view toward understanding the cassal pathways to CISA development. we hypothesized that Japanese Brazilians and whites would present different predictors of upper airway collapsibility. To test this hypothesis, lapunese-Brastlant and white men well matched for age and OSA severity (full polysomography (PSG)) underwent First recoverements and had their apper sirvery anatomy studied by CT scan and body fat composition determined by abdominal CT scan.

Materials and Methysh

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The ninty constituted of a chical interview and physical manimum to bushine PIG, upper stream and debinated CT warm, and Treat destrumentar. All procedures were performed within 14 days, however, in most adaptive. 25 Across very performed pluning that shortwarm before handline PiG, and Prev determination was printrated the following movering. The study was approved by the Hauphid Jian. Chimian etilias committee (printrate massive CEMBIN SCC 2015/98/1511. All subjects give weather industrial constant before the related stream.

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Materials and Methods

Study Design

The study consisted of a clinical interview and physical examination, baseline PSG, upper airway and abdominal CT scans, and Pcrit determination. All procedures were performed within 14 days; however, in most subjects, CT scans were performed during the afternoon before baseline PSG, and Pcrit determination was performed the following morning. The study was approved by the Hospital das Clínicas ethics committee (protocol number 0230/09; SDC 3235/08/151). All subjects gave written informed consent before the study started.

Subjects

Male Japanese-Brazilians and whites (18 to 70 years old) referred to the Hospital das Clínicas sleep clinic were recruited. To study the full spectrum of airway collapsibility, healthy subjects from the outpatient primary care clinic were also included. We excluded women; subjects with craniofacial abnormalities; those with comorbidities as defined by COPD, heart failure, chronic kidney disease, or neuromuscular diseases; and those currently using sedative medications. The Japanese-Brazilians and the whites were matched for age (\pm 7 years) and OSA severity by AHI (\pm 7 events/h). All subjects underwent a detailed clinical evaluation and a physical examination including height, weight, and waist and neck circumference. Ethnicity was self-reported. All the Japanese-Brazilians confirmed that the previous three generations in their family were either Japanese or Japanese-Brazilian without any miscegenation with other races.

Polysomnography

Subjects were evaluated by full PSG during natural sleep to identify the presence and severity of OSA. Monitoring included

EEG, electrooculography, chin and leg electromyography, electrocardiography, oximetry, measurements of airflow (pressure cannula and oronasal thermistor), and measurements of ribcage and abdominal movements during breathing (Alice 5; Philips Respironics). Sleep stages were scored manually according to American Academy of Sleep Medicine recommendations. Apnea was defined as complete cessation of airflow (thermistor) for ≥ 10 s. Hypopnea was defined as a > 30% reduction in airflow (nasal pressure) for at least 10 s associated with a 3% oxygen desaturation or cortical arousal.

Upper Airway Collapsibility Determination

Passive Critical Closing Pressure: During Pcrit determinations, all polysomnographic channels used in the diagnostic PSG were recorded, except for nasal pressure and thermistor. Pcrit measurements were performed with subjects in the supine position. Each subject was fitted with a nasal mask attached to a heated pneumotachograph (3700A; Hans Rudolf, Inc) and a differential pressure transducer (MP45-14-871; Validyne Engineering) for measurement of airflow. Mask pressure was measured by another pressure transducer (MP45-30-871; Validyne Engineering). Respiratory signals (airflow and mask pressure) were conditioned (CD 280; Validyne Engineering) and recorded on a personal computer using an analog-to-digital converter (PCI-6014; National Instruments) and custom-designed data-acquisition software (LabVIEW; National Instruments). A modified CPAP device (Philips Respironies) that could deliver both positive and negative airway pressure was attached to the mask. Sleep was induced with midazolata as described previously. 17 Briefly, 0.5 mg of midazolam diluted in a saline solution was slowly infused IV (3 min). If the subject awoke and was not able to fall asleep again within 10 min, an additional dose of midazolam was administered until stable sleep was achieved. After sleep onset, CPAP was increased to abolish airflow limitation. This level was used as the holding

Acknowledgments.

Househilwoothnessed disclosures: New designed.

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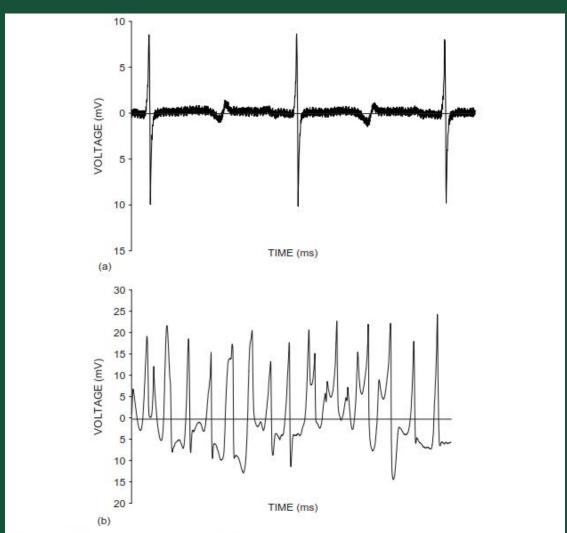


FIGURE 11.1 (a) Electrogram recorded from the surface of a pig's heart during normal sinus rhythm. (b) Electrogram recorded from the surface of the same pig's heart during ventricular fibrillation (VF). (Sampled at 1,000 samples/s.)

ELETROCARDIOGRAMA

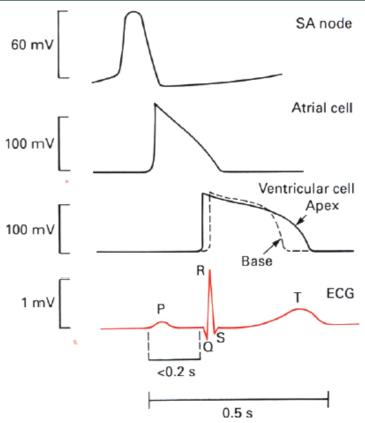


Figure 4.3 Timing of the ECG waves compared with intracellular recordings at different sites, including two sites in the ventricle (apex and base). Note that the ECG voltage scale is much smaller than that for the membrane potentials. Note also that the base (dashed line) repolarizes before the apex, which is why the T wave is upright

ELETROCARDIOGRAMA



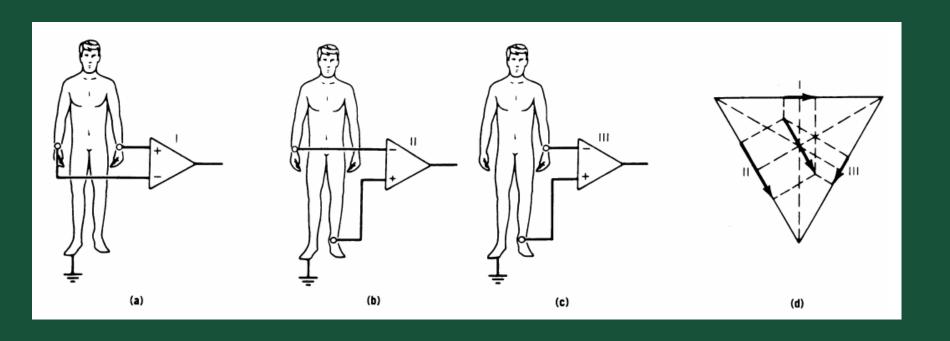
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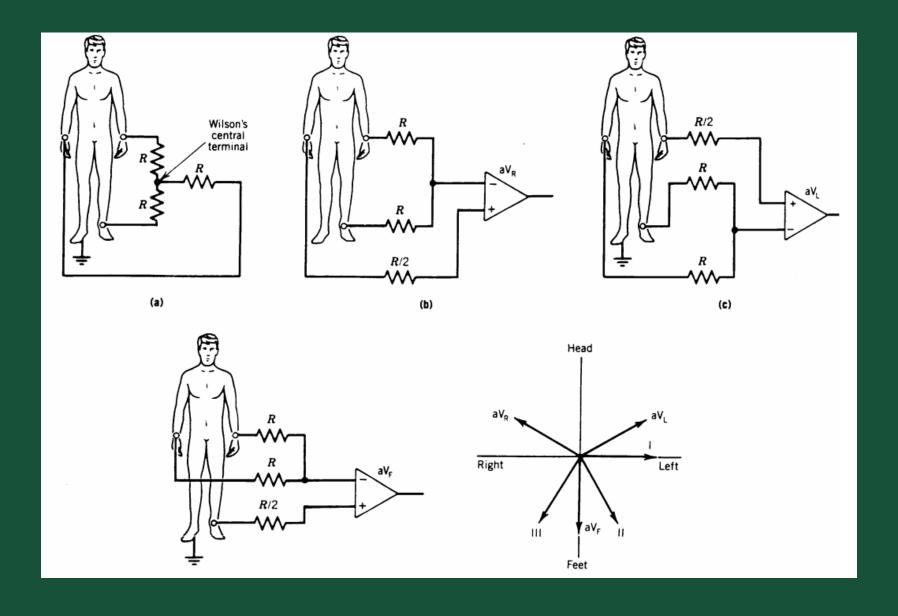


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DERIVAÇÕES BIPOLARES



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DERIVAÇÕES PRÉ-CORDIAIS

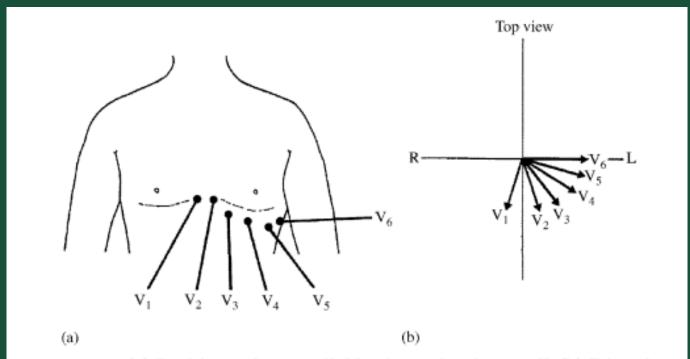
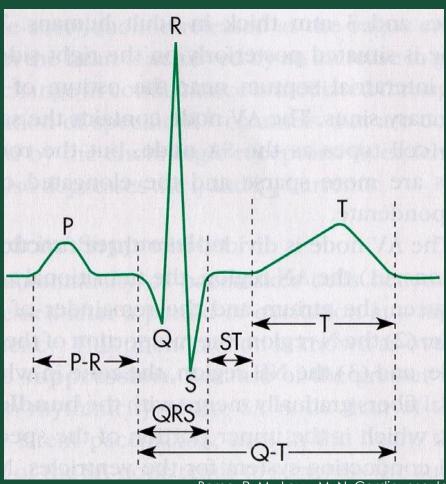


Figure 6.6 (a) Positions of precordial leads on the chest wall. (b) Directions of precordial lead vectors in the transverse plane.

DERIVAÇÕES

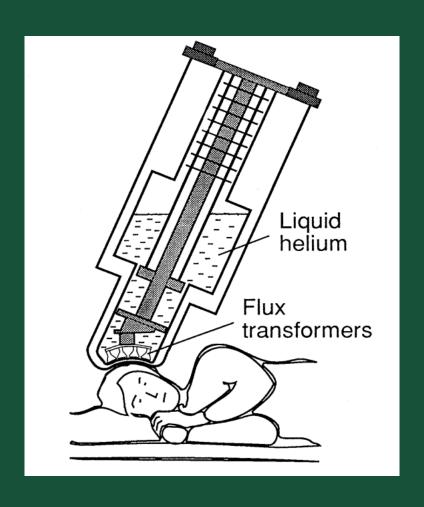
Tipo de derivação	Eletrodos usados	Definição				
Bipolar ou derivação de membros	LA, RA, LL, RL	I = LA – RA II = LL – RA III = LL – LA				
Aumentada ou deri- vação unipolar de ex- tremidade (Goldberg	LA, RA, LL, RL	aVR = RA - ½(LA + LL) aVL = LA - ½ (LL + RA) aVF = LL - ½ (LA + RA)				
Unipolares precor- diais (Wilson)	V6 (mais 1 em cada braço, 1 em cada perna, sendo a direita aterrada;	V1 = v1 - (RA+LA+LL) / 3 V2 = v2 - (RA+LA+LL) / 3 V3 = v3 - (RA+LA+LL) / 3 V4 = v4 - (RA+LA+LL) / 3 V5 = v5 - (RA+LA+LL) / 3 V6 = v6 - (RA+LA+LL) / 3				

ELETROCARDIOGRAMA ESCALAR TÍPICO

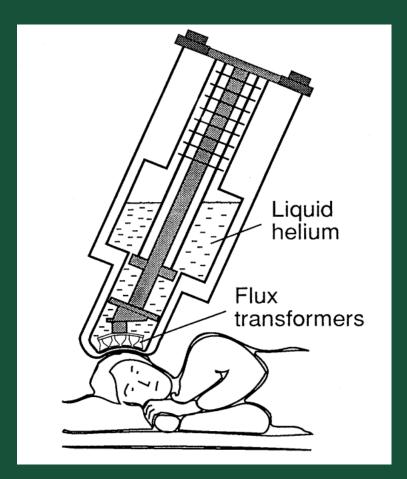


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SINAIS BIOMAGNÉTICOS



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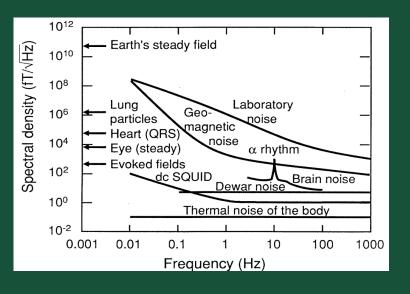


Hämäläinen et al, Rev. Mod. Phys., Vol. 65, 2, 1993



http://www.ucdenver.edu/academics/colleges/medicalschool/departments/psychiatry/Research/BrainImagingCenter/Technologies/Pages/MEG.aspx

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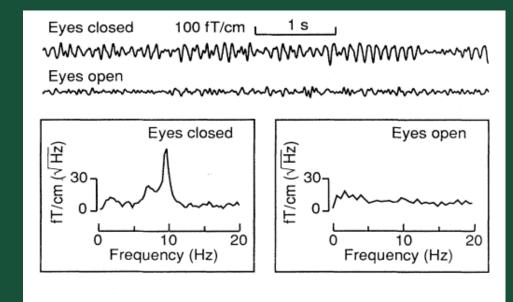


FIG. 58. Alpha rhythm on one gradiometer channel from the occipital area when the subject had his eyes closed or open. The frequency spectra were calculated from 20-s time sequences.