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International Journal of Current Research
Vol. 9, Issue, 08, pp.55822-55824, August, 2017

INTERNATIONAL JOURNAL OF CURRENT RESEARCH

ISSN: 0975-833X

RESEARCH ARTICLE

Reliability of integrated rugoscopy chart: A pilot study

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ARTICLE INFO

Article History:
Received 22nd May, 2017
Received in revised form
10th June, 2017
Accepted 15th July, 2017
Published online 31st August, 2017

Key words:

Integrated rugoscopy chart, Rugoscopy, Palatoscopy, Forensic odontology.

ABSTRACT

Background: Integrated Rugoscopy Chart (IRC) proposed in 2017 is a simple and concise resource to classify rugae pattern on the basis of position, shape and length.
Aim: To check the inter-observer reliability of IRC using sample of 50 maxillary casts.
Methodology: IRC was filled by expert panel of 3 postgraduate faculties for all 50 casts separately and sent for checking reliability.
Result: A total of 450 rugae were analyzed based on their side, shape by all 3 experts. Cronbach's alpha coefficient for the three faculties was 0.919, suggesting that experts have an excellent internal consistency and hence a reliable resource for recording rugae pattern.
Conclusion: IRC was found to be a reliable resource for rugoscopy.

Citation: Dr. Cheena Singh, Dr. Esha Singh, Dr. Kamal Sagar and Dr. Aman Chowdhry, 2017. "Reliability of integrated rugoscopy chart: A pilot study", *International Journal of Current Research*, 9, (08), 55822-55824

INTRODUCTION

Rugae patterns (rugae palatinae) situated in the anterior third of palate, can be classified based on their shape, length and number which may be a little difficult aspect for rugae studies. (Lysell, 1955; Thomas and Kotze, 1983; Venegas *et al*., 2009) The observations have subjective nature and varying interpretation within and between observers poses a problem. To prevent this Integrated Rugoscopy Chart (IRC) was proposed in 2017. (Chowdhry, 2016) IRC is a simple and concise resource to classify rugae pattern on the basis of position, shape, length, direction and quadrant. This pilot study was done to check the reliability of IRC using sample of 50 maxillary casts.

Aim: To check inter-observer reliability of IRC.

MATERIALS AND METHODS

The study group comprised of 50 patients (25 male and 25 female), age ranging from 21 to 30 years who attended the Outpatient Department of Oral Medicine and Radiology at Post Graduate Institute of Dental Sciences and Research Institute, Rohtak, Haryana (India).

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The following inclusion and exclusion criteria were considered:

Inclusion criteria:

- Age range between 18 to 30 (to ensure the presence of fully developed dental arches)

Exclusion criteria:

- Occlusal disharmony.
- Patients undergoing orthodontic treatment.
- Any patients undergoing treatment from a psychiatrist for psychological disorders.
- Full denture wearer.
- History of Cleft lip and palate surgeries
- Congenital abnormalities

Armamentarium:

1. Mouth mirror
2. Kidney trays
3. Surgical disposable gloves
4. Disposable mouth mask
5. Alginate impression material
6. Perforated impression trays

7. Rubber bowls
8. Mixing spatula (Curved and Straight)
9. Base former
10. Dark Led pencil / Cello Black Permanent Marker
11. Magnifying mirror
12. Manual Vernier caliper

Casts were prepared by taking impression from alginate impression material after obtaining the consent from the patients. The rugae pattern of the obtained casts were then delineated using a dark lead pencil.

Study set up: All observations were carried out under good lighting

Capturing of digital image of smear: Single digital image of each cast was captured using Samsung Techwin Camera (12 Mega pixel) at auto mode. American Board of Forensic Odontology (ABFO) scale # 2 was kept next to the cast to correct distortion and life size conversion of digital picture. (Figure 1) Size of the image was kept uniform to 900 x 400 pixels (width x height).

Manipulation of digital image: Every image was then life sized using Adobe Photoshop 7.0 (Adobe Systems Inc, San Jose, Calif).

Digital images of the all maxillary casts were stored on desktop. Cast was divided into 5 zones with 6 horizontal lines using paint brush software. Accordingly IRC was filled by expert panel of 3 postgraduate faculties. Completely filled IRC forms from all 3 experts were then sent for statistical analysis to check the reliability.

Data Management and Statistical Analysis: The data obtained will be entered into an Excel (Registered), and processed with SPSS (Registered).

Figure 1. Maxillary cast with delineated rugae pattern and ABFO scale# 2 next it ready for life sizing

RESULTS

The tests used were Cronbach's Alpha Based on Standardized Items. All the values were represented in number, percentage, and mean + standard deviation. Table 1 shows distribution of study subjects (rugae) by their number. A total of 450 rugae were analyzed based on their side, shape, by 3 post graduate faculties (items statistics) with a mean. Table 2 shows that Cronbach's alpha coefficient for the three faculties is 0.919, suggesting that the items (faculties) have relatively high internal consistency (reliability) which is in consistent with the present study. Table 3 shows that no significant association was detected for quadrant, shape and unification with side (p>0.05, NS) whereas, type (p=0.043, Sig.) and direction (p=0.029, Sig.) are found to be significantly associated with side.

Table 1. To show total number of rugae pattern analyzed

Item Statistics	N	Mean	Std. Deviation
Faculty1	450	2.184	.8065
Faculty2	450	2.227	.8337
Faculty3	450	2.424	.8877

Table 2. To show inter observer reliability

Reliability Statistics (n=450)		
Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.919	.922	3

Table 3. To show significant correlation between different variables of IRC

		Side				Sig.
		Left		Right		
		N	%	N	%	
Quadrant	III	47	49.0	49	51.0	Chi sq=3.17 df=2 p>0.05 NS
	IV	90	45.0	110	55.0	
	V	84	54.5	70	45.5	
	Total	221	49.1	229	50.9	
Type	Primary	3	60.0	2	40.0	Chi sq=8.17 df=3 p=0.043 Sig.
	Secondary	42	64.6	23	35.4	
	Fragmented	121	45.1	147	54.9	
	Defragmented	55	49.1	57	50.9	
	Total	221	49.1	229	50.9	
Shape	Curvy	46	46.5	53	53.5	Chi sq=1.6 df=3 p>0.05 NS
	Wavy	73	47.4	81	52.6	
	Straight	75	53.6	65	46.4	
	Circular	27	47.4	30	52.6	
	Total	221	49.1	229	50.9	
Direction	Forward	78	53.1	69	46.9	Chi sq=7.0 df=2 p=0.029 Sig.
	Backward	76	42.0	105	58.0	
	Parpendicular	66	56.4	51	43.6	
	Total	220	49.4	225	50.6	
Unification	Diverging	23	41.8	32	58.2	Chi sq=1.4 df=1 p>0.05 NS
	Converging	12	57.1	9	42.9	
	Total	35	46.1	41	53.9	

Table 4. Advantages and limitations of IRC

Advantages of IRC (4):

1. Elaborate
2. Simple
3. Cost-effective
4. comprehensive

Limitations and problems faced in IRC:

1. Quadrants for rugae cannot be entered if teeth are missing

2. Any rugae outside the quadrants cannot be entered.
3. If the rugae lies in 2 quardants then its difficult to decide which quadrant to take.

DISCUSSION

Rugae are unique for every individual and no two palates are alike in rugae configuration. Hence, palatal rugae can be one of the tools for personal identification in forensic identification. (Indira *et al*., 2012; Poojya *et al*., 2015) Rugae are protected from trauma because of their internal location in the skull. They are insulated from external heat and chemicals by teeth, tongue and buccal fat, unlike fingerprints which can be destroyed. Rugae are stable landmarks and do not undergo any changes except in length, even diseases or trauma do not affect palatal rugae form. (Acharya *et al*., 2006; Caldas *et al*., 2007; Kapoor and Miglani, 2015) Shukla D 2011 have inferred that despite the fact that a couple changes do happen in the rugae in orthodontic treatment, however the morphology of palatal rugae stays stable all through life. Consequently precisely surveyed rugae example may have an unequivocal part in measurable distinguishing proof. (Shukla *et al*., 2011) Various classifications of rugae pattern have been proposed since years. IRC is amalgamation of many classifications. The chart qualitatively and quantitatively describes the rugae pattern of a single maxillary cast. Subsequent to finishing the present study and careful appraisal, advantages and limitations of IRC have been compiled and enumerate in Table 4. The Cronbach's alpha coefficient increases as the inter-correlations among test items increases; therefore it is known as an internal consistency estimation of reliability of test scores. Cronbach's alpha coefficient for the three faculties was derived as 0.919, which is excellent internal consistency. Thus this study establishes that IRC will be a reliable resource for recording rugae pattern.

Conclusion

The present study led to an understanding of the design of the IRC and in examining the concordance and homogeneity of the integrated rugoscopy chart by human judges, by evaluating the amount of deviation and the zones of deviation of the IRC. The present pilot study proves that there is inter-observer reliability for assessment of rugae by IRC. More research and resources can be directed towards checking reliability of IRC using a larger sample. This might draw attention towards some other limitations of IRC which can be deciphered as well.

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