Research Article

JRAD Journal of Research and Advancement in Dentistry

J Res Adv Dent 2017;6:2:19-26.

Effect of Polishing After Scaling on Plaque Retention and Gingival Bleeding: A Randomized Split Mouth Clinical Trial

Ravneet K Randhawa[1*] Nidhi Gupta[2] Vikram Arora[3] Preety Gupta[4] Sahil S Thakkar[5]

[1]PG Student, Department of Public Health Dentistry, Swami Devi Dyal Hospital and Dental College, Panchkula, Haryana, India.
[2]Professor and Head, Department of Public Health Dentistry, Swami Devi Dyal Hospital and Dental College, Panchkula, Haryana, India.
[3]Senior Lecturer, Department of Public Health Dentistry, Swami Devi Dyal Hospital and Dental College, Panchkula, Haryana, India.
[4]Senior Lecturer, Department of Public Health Dentistry, Swami Devi Dyal Hospital and Dental College, Panchkula, Haryana, India.
[5]Senior Lecturer, Department of Public Health Dentistry, Swami Devi Dyal Hospital and Dental College, Panchkula, Haryana, India.

ABSTRACT

Aim: The aim of this study was to compare the effect of polishing after scaling on supragingival plaque retention and gingival bleeding.

Materials and Method: A split mouth randomized controlled trial was done among 45 subjects, All the participants were undergone supragingival scaling and then randomization was performed in order to select which quadrant to be polished(test) and unpolished(control). The plaque and gingival scores were recorded at baseline, 1 month, 3month and 6 month.

Results: The mean scores of unpolished surfaces were higher than polished surface. A statistical significant difference was observed for mean plaque and gingival bleeding scores among all the study intervals except between 1 and 3 month for both clinical parameters. A strong correlation was observed between polished bleeding and unpolished bleeding (r=0.892) after 1 month. A moderate correlation was observed between polished plaque and unpolished plaque (r=.624) after 3 months. A weak correlation exists between polished plaque and unpolished plaque (r=.482) after 6 months.

Conclusion: Surface roughness initiates the accumulation of plaque at the irregularities formed after scaling. The discontinuity of plaque growth on smooth surface achieved by polishing have important impact on periodontal health.

Keywords: Scaling, polishing. Plaque, Gingival bleeding, Splitmouth..

INTRODUCTION

Affirmation from different fields of dental research has indicated that oral deposits play a major role in the furtherance of periodontal disease[1]. Dental plaque has been proven fact by extensive research to be a paramount factor in inception and advancement of gingival and periodontal diseases[2]. A direct relationship has been demonstrated between plaque levels and the severity of periodontal disease. Since periodontal diseases are primarily inflammatory in nature, the ability to detect any inflammatory changes in gingival tissues is essential for the diagnosis and monitoring of changes in gingival status[3].A study conducted by Lang and colleagues in 1990, demonstrates how the absence of bleeding on probing (BOP) represents a reliable indicator of periodontal stability[4]. Surface roughness is a contributing factor and act as a reservoir for plaque, which forge ahead into calculus and gingival bleeding. The presence of pits and grooves promotes colonization because it shelters bacteria

Received: Jan. 6, 2017: **Accepted:** Mar. 15, 2017
*Correspondence Dr. Ravneet K Randhawa.
Department of Public Health Dentistry, Swami Devi Dyal Hospital and Dental College, Panchkula, Haryana, India.
Email: ravrandhawa22@gmail.com

pISSN 2278-0076
eISSN 2321-9270

from clearance forces of salivary flow, swallowing, chewing, and hygiene procedures and it allows them to establish less reversible bindings[5].

Periodontal treatment focuses on removal of dental plaque as well as elimination of plaque retentive factors, which facilitates self-care by patients (Addy and Koltai 1994)[6,7].Scaling is the removal of plaque, mineralised plaque, debris and staining from the crown and root surfaces of the teeth. Pumice/ prophylactic paste is used to polish the tooth surfaces, removing microgrooves and scratches which are left by scaling (Billier et al, 1980)[8]. These procedures are based on the fact that rough surfaces seem to facilitate the adhesion of bacteria (Quirynen et al, 1990)[9]. The oral hygiene habits of most individuals are not sufficient to prevent the reformation of supragingival plaque. There are few studies reporting on the level of gingivitis due to plaque retention after scaling along with polishing.This randomized controlled trial compared supragingival plaque in conjunction with gingival bleeding after supragingival scaling with and without polishing.

MATERIALS AND METHOD

Study design

A randomized, single blind split-mouth clinical trial was conducted among 83 female nursing students aged 19-24 years of Swami Devi Dyal hospital and dental college, Panchkula district, Haryana from July to December 2015.

Ethical Consideration: The protocol of the study was approved by the Institutional ethical and Review Board. Subjects were fully informed of study risks and procedures on the first visit, and a written informed consent was sought.

Eligibility criteria

Inclusion criteria**:** 1) presence of more than healthy 24 teeth i.e. 6 teeth per quadrant and free from any carious lesion 2) subjects with moderate gingivitis or presence of gingival bleeding in at least 80% of the analysed sites 4) systemically healthy.

Exclusion criteria**:** 1) presence of any plaque retentive factors on the evaluated teeth, such as orthodontic retainers, fixed prostheses, defective restorations, carious lesions and any anatomical factor that could facilitate plaque accumulation. 2) use of antibiotics in the preceding 3 months; 4) pregnancy or lactation; 5) tobacco smoking or in any other form.

Study population**:** A thorough medical and dental history was obtained from each patient, out of which only those who met the eligibility criteria were included in the study.

Clinical procedure

Selected patients underwent one session of full-mouth ultrasonic debridement lasting no longer than 20 minutes using an ultrasonic scaler. Thereafter, randomisation was performed by the flip of a coin to select which quadrant would or would not be submitted to polishing with rubber cup and prophylactic paste. Head of the coin represented to right sided quadrant and tails represented the left sided quadrant i.e., two quadrants in each patient were assigned to test treatment (supragingival polishing using the prophylactic paste) until a smooth surface was achieved and a positive control treatment (without polishing). All clinical procedures were performed by one qualified operator. The time of polishing was 30 seconds for each tooth. One examiner blinded to the experimental procedures evaluated the visible plaque index.

The amount of plaque was scored according to the criteria of the Turesky modification of the Quigley and Hein Plaque Index (QHI)[10] (Quigley & Hein 1962; Turesky et al. 1970). Gingival bleeding scores were recorded using bleeding index (Mombelli 1987)[11] The above parameters were recorded at baseline, 1, 3 and 6 months following clinical procedures. Before each study visit, subjects were refrained from oral hygiene for 24 hours. To achieve standardized condition, each subject was provided same type of tooth brush and tooth paste, during the study period the other oral hygiene aids like mouthwash and dental floss was strictly prohibited.

Measurement reproducibility

Prior to the commencement of the study, the examiner was trained by an experienced gold-standard examiner. After training, the examiner was calibrated by duplicate examinations for all clinical

Table 1: shows the mean values of plaque and gingival scores at polished and unpolished sites at different study intervals

	Polished Surface Mean ± SD	Unpolished Surface Mean ± SD	Mean difference	P value
Plaque scores				
Baseline	0.00	0.00	0.00	-
1 Month	1.15 ±0.30	1.30± 0.26	0.15	0.009
3 Month	1.25± 0.22	1.49± 0.27	0.24	0.0001
6 Month	1.43± 0.26	1.74±0.32	0.31	< 0.001
	F=311.113,p<0.001	F=374.84, p<0.001		
Gingival bleeding				
Baseline	1.27± 0.22	1.28± 0.22	0.01	0.84
1 Month	0.15± 0.09	0.21± 0.09	0.06	0.0032
3 Month	0.20± 0.09	0.27± 0.08	0.07	0.0003
6 Month	0.26± 0.12	0.41± 0.20	0.15	0.0001
	F=528.65, p<0.001	F=356.10, p<0.001		

p<0.001 is statistically significant

Table 2: Mean difference between plaque and gingival bleeding of polished and unpolished surfaces at different study intervals

	Polished Surface		**Unpolished Surface**	
	Mean diff.	P value	Mean diff.	P value
Plaque				
Baseline vs 1 month	1.15	<.001	1.30	<.001
Baseline vs 3 month	1.12	<.001	1.49	<.001
Baseline vs 6 month	1.43	<.001	1.74	<.001
1month vs 3 month	0.09	0.37	0.19	0.005
1month vs 6 month	0.27	<.001	0.44	<.001
3 month vs 6 month	0.17	0.005	0.24	<.001
Gingival Bleeding				
Baseline vs 1 month	1.11	<.001	1.07	<.001
Baseline vs 3 month	1.06	<.001	1.01	<.001
Baseline vs 6 month	1.01	<.001	0.86	<.001
1month vs 3 month	0.04	1	0.06	0.64
1month vs 6 month	0.10	0.014	0.20	<.001
3 month vs 6 month	0.05	0.491	0.14	<.001

p<0.001 is statistically significant

Table 3: Pearson correlation between different study variable

Baseline	**r**	**p-value**
PolBIeeding x UnpolBIeeding	.990(**)	<.001
1 month		
Pol Plaque x Pol BIeeding	0.015	.929
Pol Plaque x UnpolnPlaque	.427(**)	.007
Pol Plaque x UnpolBIeeding	.045	.784
Pol BIeeding X UnpolPlaque	.426(**)	.007

Pol BIeeding x UnpolBIeeding	.892 (**)	<.001
Unpolplaque x UnpolBleeding	.391 (*)	.014
3months		
Pol plaque x pol bleeding	.113	.495
Pol plaque x unpol plaque	.624(**)	<.001
Pol plaque x unpol bleeding	-.009	.956
Pol bleeding x unpol plaque	.370(*)	.020
Pol blleding x unpol bleeding	.698(**)	<.001
Unpol x unpol bleeding	.281	.083
6 month		
Pol plaque x pol bleeding	-.227	.164
Pol plaque x unpol plaque	.482(**)	.002
Pol plaque x unpol bleeding	.258	.113
Pol bleedin x unnpol plaque	.201	.219
Pol bleedin x unpol bleeding	.034	.836
Unpol plaque unpol bleeding	.116	.481

Pol – polished, Unpol – unpolished

**** Correlation is significant at the 0.01 level (2-tailed).**

* **Correlation is significant at the 0.05 level (2-tailed).**

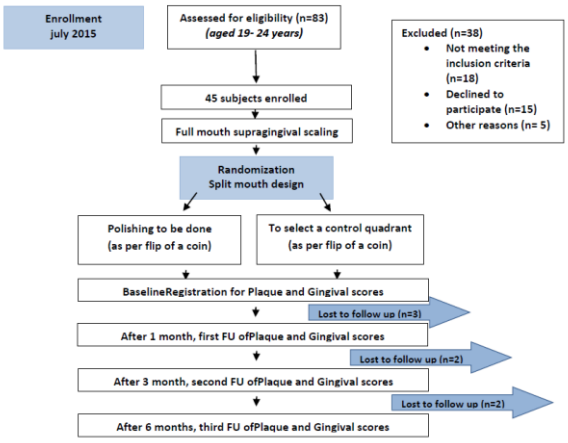

Fig 1: Depicts the flowchart of the study design; FU-Follow up.

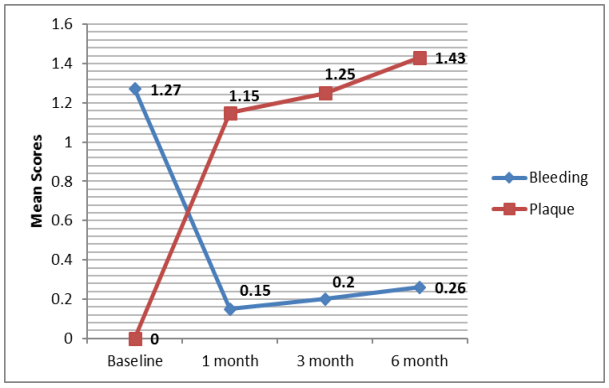

Fig 2a: Depicts gingival and plaque scores of polished surface at different study interval.

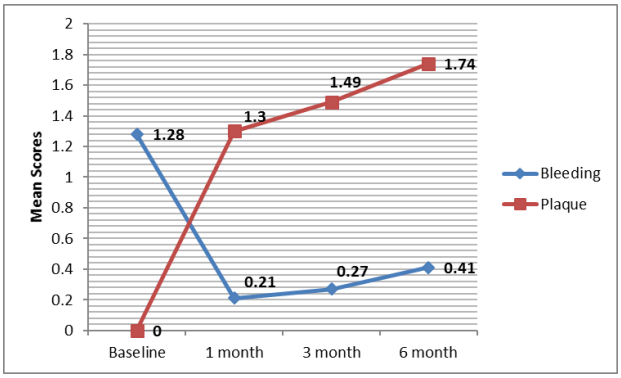

Fig 2b: Depicts Gingival and plaque scores of Unpolished surface at different study interval.

parameters on six patients, with a 1-h interval. The agreement was analysed by the kappa test and revealed reproducibility coefficients of 0.86 for plaque index. Due to the nature of the gingival bleeding score, only training was performed for this parameter.

Statistical Analysis

The data was analyzed considering the subject as the unit of analysis. The results were expressed in mean and standard deviation of polished and unpolished sites of plaque and gingival index at different time intervals. Mean comparisons within the group were computed using analysis of variance (ANOVA), after which multiple comparisons within the groups were conducted

using the post-hoc test.Pearson's correlation test was used in order to determine the association between plaque and gingival bleeding scores at baseline, 1month, 3month and 6month. The differences between the age groups were tested with Independent sample t-test.The significance level was set at 5% and the confidence interval was set as 95%. All analysis were done using the statistical package of social sciences 20.0 software (SPSS Inc., Chicago, IL)[12]

RESULTS

Out of 45 subjects enrolled, 39 were available for the final analysis. A significant increase, persisting over the entire follow-up period was noted for plaque and gingival bleeding scores. A statistically significant difference was observed among all the study intervals both for plaque and gingival bleeding scores ($p<0.001$). No significant difference was observed between the baseline of plaque and gingival scores for polished and unpolished sites, which revealed all the study subjects were at same clinical parameters. A statistically significant difference was observed between polished and unpolished sites of plaque and gingival scores at 1, 3 and 6 months ($p<0.001$) except baseline. **(Table 1)** On applying post-hoc test, a statistical significant difference was observed for mean plaque and gingival bleeding scores among all the study intervals except between 1 and 3 month for both clinical parameters. **(Table 2)**

A strong correlation was observed between polished bleeding and unpolished bleeding ($r=0.892$) whereas a weak correlation exists between polished plaque and unpolished plaque ($r=0.427$) and between polished bleeding and unpolished plaque ($r=0.426$) after 1 month. A moderate correlation was observed between polished plaque and unpolished plaque ($r=.624$) after 3 months. A weak correlation exists between polished plaque and unpolished plaque ($r=.482$) after 6 months.**(Table 3)**

Fig. 2(a) &2(b) highlights the relationship between plaque and gingival bleeding in polished and unpolished surfaces. The Pearson correlation between mean of plaque and bleeding scores at the 3 visits i.e one three and six month was ($p=0.001$).

DISCUSSION

Arguably, in developed countries the most commonly practiced oral hygiene method is cleaning one's teeth with a toothbrush and toothpaste[13]. The toothbrush alone mechanically, along with abrasives and detergents in the dentrifice removes plaque[14]. It is a common observation that due to paucity of time, most individuals spend less time during their daily tooth-brushing cycle and hence, calculus formation is found in majority of the people. The present study was undertaken in order to assess and compare the supragingival plaque in conjunction with the gingival bleeding after supra gingival scaling with and without polishing. The experimental, split mouth design was used in this study as it allows comparisons within the same subject which assures that individual differences in oral hygiene and microbiota characteristics, diet, saliva composition and immune response would not influence the followups and thus, making our results more unambiguous.

In the present study, the baseline scores were recorded after scaling and polishing so that the results were not affected by the individual differences in plaque and gingival bleeding scores of the subjects. Moreover, the differences observed among the three follow-ups, from baseline to 6 months between the polished and unpolished sites reveal a statistically significant difference, similar results were observed in the studies done by Swarts ML (1957) Waring MB et al.(1982)[15,16]. This can be attributed to the formation of plaque with time, as the initial bacterial adhesion which is influenced by the surface roughness is supposed to pass through a phase with a "weak and reversible" binding before an irreversible binding is established (Carlsson 1983) and Lie's (1979) observed that the early plaque accumulation starts from pits and grooves from where the bacteria subsequently spread over the tooth surface[17,18].

The present study also revealed that there was a positive correlation between plaque and gingival bleeding during the course of the study i.e. plaque accumulation is directly proportional to gingival bleeding scores as the plaque increases the gingival scores also increases, this is suggestive of plaque induced gingivitis. Similar findings were observed Theilade E et al[19] which supported that gingivitis is induced by plaque formation. It was also

revealed that although there was a significant difference in plaque and gingival bleeding scores at different time intervals, the scaling and polishing intervention or the frequency of its provision (often 6-monthly) to maintain or improve periodontal health is not necessary as, Claire Jones et al. (2013) support that scaling and polishing at 12- or 24-months was shown to have the same benefit as the more traditional 6-monthly scaling and polishing[20].

The relation of tooth surface roughness to plaque regrowth appears important. Plaque growth normally starts at the gingival margin and in interdental spaces and grows in a coronal direction (Mierau& Singer 1978, Mierau 1984)[21,22]. This study clearly illustrates that the normal plaque growth pattern may change fundamentally in the presence of irregularities on the tooth surface and thus confirms the importance of mechanical retention factors in early plaque growth.

The Turesky- Gilmore- Glickman modification (1970) of the Quigley-Hein plaque index used in this study is a reliable index for measuring plaque removal after toothbrushing and has been widely used in several toothbrush studies (Aass and Gjermo, 2000; Conforti et al, 2003; Daly et al, 1996; Hogan et al, 2007; Tan and Daly, 2002)[23,24,25,26,27,28]. However, a major disadvantage of most of the plaque index systems is their subjectivity (Sicilia et al, 2002; van der Weijden and Hioe, 2005). This underscores the need for the inclusion of intra- and inter-examiner calibration and reproducibility exercises in any proper clinical trial assessing plaque removal with toothbrushing[29,30]. Without disturbing plaque growth, it is almost impossible to measure plaque thickness so, no measurements of this parameter were undertaken.

Furthermore, the polishing of teeth after scaling using an abrasive paste on rotating brushes, also removes outer layers of enamel and dentine. For most individuals the provision of scaling and polishing causes some discomfort and in some cases this discomfort may be judged to be quite considerable. The actual noise or sensation of instruments on the tooth surface may be unpleasant. The scraping of exposed dentine may elicit pain as may the mechanical engagement of the gingival tissues by metal instruments.

CONCLUSION

From the overall results it can be concluded that polished surface shows a significant difference in plaque and bleeding scores comparable to unpolished ones. Oral hygiene instruction, scaling and polishing teeth are medical acts required to maintain an optimal periodontal status. And also presumed that the presence of bacterial laden plaque to initiate and/or exacerbate the severity of the disease and support the hypothesis of plaque induced gingivitis. Last but not the least most important findings of our study concluded that The surface-finishing did not allow bacteria to establish a firm adhesion to Plaque and its maturation is observed to be related to the rough surface.

ACKNOWLEDGEMENT

The author express sincere appreciation and thanks to nursing students for their participation throughout course of the clinical trial without their cooperation this study would not have been possible.

CONFLICT OF INTEREST

No potential conflict of interest relevant to this article was reported.

REFERENCES

1. Loe H, Theilade E, and Jensen BS. Experimental Gingivitis in Man. J Periodontol 1965;36(3):177-187.

2. Fine HD. Chemical agents to prevent and regulate plaque development. Periodontol 2000 1995;8:87-107.

3. S. Muthukumar, Anand MV, Madhankumar S.Relationship between gingival bleeding and anaerobic periodontal infection assessed by BANA (N-Benzoyl-DL-Arginine-β-Napthylamide) assay. J Pharm Bioallied Sci. 2014 Jul; 6(Suppl 1): 70–73.

4. Lang NP, Adler R, Joss A, Nyman S. Absence of bleeding on probing. An indicator of periodontal stability. J ClinPeriodontol 1990; 17: 714-21.

5. Rimondini L, Fare S, Brambilla E, Felloni A, Consonni C, Brossa F and Carrassi A. The Effect

of Surface Roughness on Early In Vivo Plaque Colonization on Titanium. J Periodontol 1997;68:556-562.

6. Addy M, Koltai R. Control of supragingival calculus. Scaling and polishing and anticalculus toothpastes: an opinion. J ClinPeriodontol 1994;21:342-346.

7. Zanatta FB, Pinto TMP, Kantorski ZP, Rösing CK. Plaque, Gingival Bleeding and Calculus Formation After Supragingival Scaling With and Without Polishing: A Randomised Clinical Trial.Oral Health Prev Dent 2011; 9: 275-280.

8. Billier IR, Hunter EL, Featherstone M. Enamel loss during profilaxis polish in vitro. J IntAssoc Dent Child 1980;11:7-12.

9. Quirynen M, Marechal M, Busscher HJ, Weerkamp AH, Darius PL, van Steenberghe D. The influence of surface free energy and surface roughness on early plaque formation. An in vivo study in man. J ClinPeriodontol1990;17:138-144.

10. Turesky S, Gilmore ND, Glickman I. Reduced plaque formation by the chloromethyl analogue of victamine C. J Periodontol. 1970;41(1):41–43.

11. Mombelli A, van Oosten MAC, Schu¨rch E Jr, et al. The microbiota associated with successful or failing osseointegrated titanium implants. Oral Microbiol Immunol1987;2:145-151.

12. IBM Corp. Released 2011. IBM SPSS Statistics for windows, Version 20. Armonk, NY; IBM Corp.

13. Frandsen, A. Mechanical oral hygiene practices. In: Dental plaque control measuresand oral hygiene practices, eds. Loe, H. &Kieinman. D. V IRL Press, Oxford, UK. 1986;93-116.

14. Moran, J. &Addy, M. Antimicrobial toothpastes m oral hygiene control. ManufacturingChemist 1988;59:27-30.

15. Waring MB, Horn ML, Ames LL. Plaque accumulation following engine polishing or toothbrushing. A 90-day clinical trial. Dent Hyg1988;62:282-285.

16. Swartz ML, Phillips RW. Comparison of bacterial accumulations on rough and smooth enamel surfaces. J Periodontol1957;28:304-309.

17. Carlsson J. (1983) Microbiology of plaque associated periodontal disease. In: Lindhe, J. (ed.): Textbook of clinical periodontology. Munksgaard, pp. 125-153.

18. Lie T. Morphologic studies on dental plaque formation. ActaOdontologicaScandinavia 1979;37:73-85.

19. Theilade E, Wright W H, Jensen S B &Loe H. Experimental gingivitis in man. II. A longitudinal clinical and bacteriological investigation. J. Period. Res 1966;1:1-13.

20. Jones et al. Patient perceptions regarding benefits of single visit scale and polish: a randomised controlled trial. BMC Oral Health 2013; 13:50.

21. Johnson KE, Sanders JJ, Gellin RG, Palesch YY. The effectiveness of magnitised water oral irrigator(hydrofloss) on plaque , calculus and gingival health. J clinc periodontal 1998;25:316-321.

22. Mierau HD. Relations between plaque formation, tooth surface roughness and self-cleaning .DtschZahnarztl Z 1984;39:691.

23. Mierau HD, Singer D. Reproducibility of plaque formation in the dento-gingival regional. DtschZahnarztl Z 1978; 33:566.

24. Aass AM, Gjermo P. Comparison of oral hygiene efficacy of one manual and two electric toothbrushes. ActaOdontolScand 2000; 58(4):166-170.

25. Conforti NJ, Cordero RE, Liebman J, Bowman JP, Putt MS, Kuebler DS, Davidson KR, Cugini M, Warren PR. An investigation into the effect of three months' clinical wear on toothbrush efficacy: Results from two independent studies. J Clin Dent 2003;14:29-33.

26. Tan E, Daly C. Comparison of new and 3-month-old toothbrushes in plaque removal. J ClinPeriodontol2002;29:645-650.

27. Daly CG, Chapple CC, Cameron AC. Effect of toothbrush wear on plaque control. J ClinPeriodontol1996;23:45-49.

28. Hogan LM, Daly CG, Curtis BH. Comparison of new and 3-month-old brush heads in the removal of plaque using a powered toothbrush. J ClinPeriodontol2007;34:130-136.

29. Sicilia A, Arregui I, Gallego M, Cabezas B, Cuesta S. A systematic review of powered vs. manual toothbrushes in periodontal cause-related therapy. J ClinPeriodontol 2002;29 (Suppl. 3):39-54.

30. Van Der WeijdenGA, Hioe KPK. A systematic review of the effectiveness of self-performed mechanical plaque removal in adults with gingivitis using a manual toothbrush 2005;32:(6) :214–228.