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# Comparative evaluation of surgical and conservative treatment modalities of juvenile periodontitis patients

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#### Summary

In a comparative evaluation of the effectiveness of two treatment modalities for juvenile periodontitis, 12 patients aged between 15 years and 23 years were recruited into a six months longitudinal study. The split mouth design was used such that one side (upper and lower quadrants) received conservative treatment. Each side was randomly assigned one of the two treatment modalities. Standardized probing attachment level (PAL) measurement and degree of mobility of the teeth were taken at recruitment (baseline), one, three and six months postoperation. Tetracycline capsules 250mg, 6 hourly, was administered for 2 weeks at baseline and at 3 months follow-up. Initial thorough scaling and polishing of the whole mouth was done for all the patients. At follow-up, there were marked improvements seen with both treatment modalities. The mean probing depth for surgical treatment  $(3.57 \text{mm} \pm 0.78)$  was significantly lower than that of conservative treatment (4.11mm  $\pm$  0.74) P < 0.05 at 3 months. Also, this significant difference continued up to 6 months  $(2.70 \text{ mm} \pm 0.57, 3.55 \text{ mm} \pm 0.65; P < 0.05)$ . For the degree of mobility, significant difference was only evident at 6 months of follow-up (0.48  $\pm$  0.29, 0.98  $\pm$  0.523 ; P < 0.05 ) for surgical treatment and conservative treatment respectively. It was therefore concluded that surgical debridement with systemic administration of tetracycline is more effective than the conservative technique in the treatment of juvenile periodontitis, although both gave improvement.

**Keywords**: Comparative, surgical, conservative, treatment, *juvenile periodontitis*.

# Résumé

L'évaluation comparée des modalités de traitement chirurgique et conventionel des malades périodontitis juvénile.Dans une évaluation comparée de l'éfficacité de deux modalités de traitement de périodontitis juvénile, 12 malades don't leur âges étaient entre 15 à 23 ans ont été récrutés pour une étude longitudinale de six mois. La méthode "split mouth" était employée de telle façon qu'un coté (les quadrants supérieurs et inférieurs) a recu un traitement conventionel. Chaque coté a recu au hasard un des deux modalités de treatement. La dimension de niveau d'accessoire sondage de connaissance commun à tous les établissements et le degre de la mobilité du dents ont été pris au récrutement (au commencement), un, trois et six mois post-operationnellement. Les capsules 250mg de Tetracycline de chaque six heure sont admis pour 2 semaine au commencement et à 3 mois de suivi. Un détartrement, la soignée complète et initiale de toute la bouche étaient faits pour tous les malades. Lors de la suivi, il y avait des améliorations remarquées dans les deux modalités de traitement. La moyenne du profondeur pour un traitement chirurgique  $(3,57mm \pm 0,78)$  était significativement inférieure au treatement conventionnel (4,11mm  $\pm$  0,74) P <

Correspondence: Dr. E.B. Dosumu, Department of Preventive Dentistry, Dental Centre, University College Hospital, Ibadan, Nigeria 0,05 pendant 3 mois. Cette différence significative avait aussi continué à remontrer jusqu'à six mois. (2,70mm  $\pm$  0,57 Vs 3,55mm  $\pm$  0,65; P < 0,05). Pour le degré de mobilité, la différence significative était évident surtout au sixième mois de la suivi (0,48  $\pm$  0,29  $\pm$  0,98  $\pm$  0,523; P < 0,05) pour les traitements chirurgiques et conventionnel respectivement.On a ainsi fait une conclusion que le traitement chirurgique et l'administration systémique de tetracycline est plus éfficace que la technique conventionelle de treatment de périodontitis juvénile bien que les deux améliorent la situation.

#### Introduction

Juvenile periodontitis (JP) is a chronic inflammatory disease of the periodontium occuring in an otherwise healthy adolescent [1]. . The most obvious clinical indicator is severe periodontal destruction leading to intrabony defects, deep periodontal pocket formation, tooth mobility and loss of teeth, all of which partly result from poor host defense [2]. The amount of destruction is not commensurate with the amount of local irritants and it is one of the most debilitating periodontal diseases affecting adolescents [3]. Since the importance of Actinobacillus actinomycetemcomitans (Aa) in the actiology of JP was recognized, periodontal treatment of JP had been directed towards the elimination of Aa in sub-gingival sites and correction of the soft tissue and osseous lesions produced by the disease [4]. Accordingly, a number of different modalities have been used in the treatment of JP, most of which result in at least initial clinical improvement. Various therapeutic techniques for the treatment of JP are reported in the literature, with occasional contradictory results which may be attributed to differences in patient selection and/or response. It is generally accepted that periodontal therapy is successful in arresting the progression of most chronic periodontitis and maintaining the integrity of the teeth. Longitudinal trials have also been conducted for several years to evaluate the efficacy of periodontal therapy. The split mouth therapy design was introduced to compensate for the biological variability of individual patients [5,6]. Several split mouth longitudinal studies have compared "non-surgical therapy" to different surgical techniques in chronic periodontitis patients and not JP patients. Most of these studies found that both types of therapy reduced probing depths during shortterm evaluation ( $\leq 1$  year), but that surgical therapy results in greater probing reduction than root planning or curettage [5,7,8].

Results comparing attachment levels between nonsurgical and surgical therapy on a short-term evaluation are mixed. Of these short-term reports, some have shown that surgery resulted in a greater gain in probing attachment [7,8,9], some showed no difference [7,9,10] while others showed that root planning and curettage created a greater gain of the long-term trials ( $\geq$  5 years) [11-13], Lindhe *et al* [14] basically reported no difference in probing attachment levels between sites treated with root planning and those with surgical therapy. Philstrom *et al* [9] reported that surgery resulted in better maintenance of probing attachment than root planning in 4 - 6mm sites over a  $6^{1/2}$ , year period and that no difference was present between the two methods in the  $\geq$  7mm category. Isidor and Karring [15] also reported that root planing provided a slight gain in probing attachment compared to modified Widman or reverse bevel flap surgery after 5 years. Rosling *et al.* [16] showed that periodontal tissue will regenerate following various flap procedures in patients who maintain a high level of oral hygiene. In our literature search, no study had been done using the split mouth therapy technique for JP patients. Also previous studies on JP reported on patients at peripubertal age unlike in this study, where majority of our patients presented late at about 15years-31years.

Therefore, the present study is to compare the efficacy of surgical and conservative treatment modalities among Nigerian JP patients using the split mouth therapy technique.

# Materials and methods

# Patients selection

Twelve adolescents (7 females and 5 males, age range 15-23 years) with a total of 156 teeth were recruited into this study. The patients were referred to the periodontology unit of the Dental Centre of the University College Hospital, Ibadan. The selection criteria were:.

- 1. Diagnosis of juvenile periodontitis.
- Radiographic vertical bone loss on the mesial surfaces of at least 4 pairs of teeth
- 3. Probing attachment loss (PAL)  $\geq$  5mm
- No systemic diseases
- No systemic antibiotics for at least 6 months prior to treatment
- 6. Not pregnant
- Good plaque control after initial full mouth scaling and polishing.

# Pre-treatment management

Each patient was subjected to a full diagnostic workup, which included a thorough medical history, full mouth radiographs using a set of 12 periapical radiograph films (EKTASPEED) with a Chirana roentgen machine (65kup/7.5MA) and employing the modified parallel and long-cone techniques. Study models and full mouth clinical photographs were taken. A complete clinical examination was carried out recording the probing depths (PD) with the use of a calibrated periodontal probe (Ash) and the degree of tooth mobility by digital examination using the Miller mobility index. Pre-surgical preparation included thorough full mouth scaling and polishing with oral hygiene instructions. Each patient's right and left side (upper and lower quadrants) was randomly assigned the conservative or surgical treatment. If one side (upper and lower quadrants) received the conservative treatment, the contralateral side (upper and lower quadrants) received the surgical treatment, hence each patient received both the conservative and the surgical treatments. Capsule tetracycline 250mg 6 hourly for two weeks was administered to all the patients after the initial scaling and polishing, prior to the commencement of various modalities. An informed consent was obtained from each patient following explanation of the risks. Ethical clearance was similarly obtained for the study from the joint University of Ibadan/University College Hospital Ethical Committee. All the twelve patients completed the study.

The baseline examination included oral hygiene status (Plaque Index [17], Calculus Index [18]), and oral hygiene index simplified (OHI - S)[18], the gingival condition (gingival index [19]), probing depths to the nearest millimetre (mm) and the degree of mobility (Miller Mobility Index [20]). These measurements were repeated at 1,3 and 6 months.

#### Treatment protocol

At the commencement of the treatment, one week after the initial scaling and polishing, both sides of either jaws (upper or lower) received either of the treatment modalities at the same visit to rule out the possibility of the influence of time interval in healing. The treatment of both sides of the other jaw was done two weeks after that of the previous jaw and a one week course of tetracycline was given after this second stage of treatment, Tabs of paracetamol 1000mg 8hrly for three days, was prescribed after each stage of treatment to take care of pain. The interval between the two stages of treatment was put at two weeks to allow patient recuperation from the first stage. A longer interval could not be given because of the possibility of significant improvement of the clinical parameters following systemic tetracycline administration from the baseline values.

The sides that were assigned surgical treatment had the standard surgical technique under 2% xylocaine local anaesthesia which consisted of internally bevelled incisions at the free gingival margin, full thickness mucoperiosteal flap reflection and thorough defect debridement with 0.9% normal saline. The inter-dental papillae were conserved and incisions were extended by one tooth anteriorly and posteriorly to the tooth/teeth being treated. Releasing incisions were utilized when necessary in order to facilitate visibility and debridement of defects. Flaps were replaced and secured with interrupted proximal 3.0 black silk suture material. Peripac (De Trey Dentsply) periodontal dressing was applied after surgery. Warm saline mouth rinse 6x daily from the day after surgery and careful brushing with a soft toothbrush for 2 weeks were given as post-surgical instructions. All the patients tolerated the procedures. Healing was uneventful for all patients. Sutures were removed 7 days post-surgery.

The conservative treatment consisted of root planning and deep gingival curettage using curettes by way of the lumen of the periodontal pocket to remove the soft tissue walls of the pockets and the connective tissues subjacent to the levels of the alveolar crests. All clinical procedures, clinical measurements and examinations were performed by one of the authors (EBD).

Patients were seen monthly for the first 3 months and at 6 months during which professional prophylaxis was performed and oral hygiene instructions reiterated.

### Statistical Analysis

The means and standard deviation of the Plaque, Calculus, Oral Hygiene Index - Simplified and the Gingival Indices were obtained at baseline, i.e., pre-operatively and also post-operatively 1, 3 and 6 months. The Student's paired t-test was used to test the differences between the 2 treatment modalities with respect to the alteration of probing depth and degree of mobility. Analysis of variance (ANOVA) was performed, which allowed for the comparison among more than two variables.

### Results

Healing was uneventful for both treatment modalities in all the patients. The oral hygiene indices (PI, CI and OHI-S) and the Gingival Index (GI) scores throughout the period of the study are shown in Table 1. All the patients maintained low mean plaque, calculus, oral hygiene and gingival indices scores at all the follow-up examinations although there was a gradual rise as the period of examination increased. Tables 2 and 3 and figures 1 and 2 show the changes in the mean probing depth and the degree of mobility respectively, at baseline 1,3 and 6 months post-operative follow-up. The baseline clinical datae were not significantly different in the 2 treatment modalities (P > 0.05).

 Table 1: Means and standard deviation of the oral hygiene status indices.

Period of Exa (months)	im. G1	Pl	Cl	OHIS
0 Baseline	1.24±0.45	1.50±0.47	1.19±0.46	2.68±0.86
1 3 6	0.20 0.34 0.18±0.15 0.40±0.31	0.31±0.2 0.42±0.31 0.69±0.34	0.12±0.14 0.23±0.19 0.50+0.28	0.41±0.31 0.66±0.48

Table 2: Changes in mean probing depth (mm).

Period of examination (months)	Surgical treatment	Non-surgical treatment	P Value vlaue	Wilcoxton statistic	Significant level
0	5.08 ± 0.46	5.90 ± 1.05	0.2860	21	Not
1	5.08 ± 0.7	$15.46 \pm 0.94$	0.5794	13	Significant Not
3	3 57 ± 0.78	3 4.11 ± 0.74	0.0414		Significant
6	2 70 ± 0.5	7 3.55 ± 0.65	(<0.05) 0.0029	13	Significant
			(<0.001)	1	Significant

Table 3: Changes in degree of mobility

Period of examination (months)	Surgical treatment	Non-surgical treatment	P Value	Wilcoxton statistic vlaue	Significant level
0	2.0798 ±	2.0807 ±	0.9964	26.5	Not
(Baseline)	0:5288	0.5288			Significant
1	2.0071 ± 0.4770	1.9543 ± 0.5183	0.7975	21.5	Not Significant
3	0.9273 ±	1.2598 ±	0.0559	11.5	Not
	0.4395	0.5908	(<0.0550)		Significant
6	0.4746 ±	0.9787 ±	0.0048	3	-
	0.2918	0.5163	(<0.01)		Significant



Fig. 1: Changes in mean probing depth.

Both treatment modalities gave improvement in the probing depth and degree of mobility throughout the period of examination. The surgical technique gave significantly better improvement both clinically and statistically for the probing depth both at the 3 and 6 months follow-up examination than the conservative treatment modality (P < 0.05)



Fig. 2: Changes in mean mobility index

However, surgical treatment significantly affected the degree of mobility only at the 6 months examination as compared to the conservative treatment (P<0.05).

At one month follow-up, a higher reduction in the clinical probing depth was noticed in the surgical treatment, although this was not statistically significant. Likewise, no statistically significant difference was noticed in the mean mobility index at this time, although the non-surgical technique gave a higher clinical reduction.

Table 4 is the Anova summary table drawn for the probing depth (4A) and the mean mobility index (4B) changes as related to age, type of treatment and the period of examination. The type of treatment and the period of examination significantly affected the changes in these clinical parameters.

 Table 4: Anova summary table showing changes in the

 probing depth (mm) and mean mobility index related with age,

 type of treatment and period of examination

# 4a: Probing depth (mm)

Source of Variation	Df Value	Sum of squares	f Mean squares	P Valve	P Valve	Significant level
Type of						
treatment	1	5.4093	5.4093	8.8428	0.0039	Significant
Age	1	2.1276	2.1276	3.480	0.0659	Significant
Period of examination	3	89,8933	29.9644	48.9836	0.000	Not Significant
Gender	1	0.0135	0.0135	3.5967	0.0724	Not Significant

# 4b: Mean mobility index

Source of Variation	Df Value	Sum of squares	Mean squares	P Valve	P Valve	Significant level
Type of						
treatment	1	1.0477	1.0477	4.7665	0.0310	Simil C
Age	1	2.7232	2.7232	12.3894	0.0319	Significnat
Period of					0.0007	Significant
examination	3	31.6171	10.5390	47.9473	0.000	Significant
Gender	1	0.0135	0.0135	3.5967	0.0724	Not Significant

Table 5 is also a summary of the changes in probing depth and mean mobility index as related to age, gender, type of treatment and period of examination.

 Table 5:
 Significance levels of changes in clinical parameters as related to

Clinical parameter	Age	Gender	Type of treatment	Period of examination
Probing	P value 0.0659	P value 0.0724	P value 0.0039	P value 0.000
depth (mm)	Not significant	Not significant	Significant	Significant
Mean Mobi	P value 0.0007	P value 0.0724	P value 0.0319	P value 0.000
lity Index	Significant	Not significant	Significant	Significant

#### Discussion

Several authors have reported that the treatment of JP is unsuccessful if Actinobacillus actinomycetemcomitans is not eliminated from the pockets [21-23]. Since this organism can invade pocket epithelium, bone and connective tissue [24], some clinicians have recommended the use of systemic antibiotics and periodontal surgery for successful treatment of JP [21,24], while some reported good prognosis with conservative treatment and antibiotics [22,23]. The reasons for the contradictory results may be differences in patient selection, patient responses to treatment, age of patient, advancement of the disease at the time of presentation and the type of treatment modality used. In this study all but one of these patients presented very late when the disease had advanced. Each of these treatment modalities reported by these authors [21-24] was performed to study the effectiveness of either of these treatment modalities on different individual patient with juvenile periodontitis.

The efficacy of either of these (surgical and conservative) treatment modalities of JP was assessed in this study by the level of improvement of the probing depth and degree of mobility during the follow-up examinations of the patients and each patient received both treatment modalities unlike in the previous studies.

The recognition that periodontal diseases are primarily caused by specific microorganisms has led researchers to explore the possibility that antibiotics may enhance the effect of mechanical debridement procedures such as scaling and surgery. For some selected periodontal diseases, such as juvenile periodontitis, this has been proven to be true. Tetracycline is bacteriostatic and possesses high in-vitro activity against several suspected periodontal pathogens including *Actinobacillus actinomycetemcomitans* [25]. It appears to concentrate in the periodontal pocket, and its antibacterial efficacy may be prolonged through its ability to bind to both enamel and dentine surfaces [26].

In addition, tetracycline has recently been shown to suppress collagenase activity of *Actinobacillus actinomycetemcomitans* in crevicular fluid and to inhibit osteoclast mediated bone resorption in-vitro [26-27].

It is widely known that local concentrations at the site of infection can widely differ from blood or serum levels. For an antibiotic to be effective in periodontal treatment, it must penetrate well into gingival fluid and achieve higher concentrations than the minimal inhibitory concentrations of the suspected pathogens. The tetracyclines are unique in that they are the only class of antibiotics tested to date that achieve gingival fluid levels higher than blood levels [26,28].

In a well controlled study of the treatment of localized juvenile periodontitis (LJP) patients, Genco *et al* [29,30] reported that patients given tetracycline 250mg 6hrly for 2 weeks and repeated every 8 weeks for 18 months produced a better bone "fill" than the placebo group. Several other researchers support the use of tetracycline in the treatment of LJP and based on these observations, Gordon and Walker [31] suggested that tetracycline be continued for at least 3 weeks instead of 2 weeks. Although treatment of LJP without the use of antibiotics can sometimes be effective, the above mentioned studies present strong evidence that use of tetracyclines facilitates elimination of *Actinobacillus actinomycetemcomitans* and attainment of a successful clinical result. Hence, based on the above reports, tetracycline was given to each of the patients for 3 weeks during the period of treatment and at 3 months follow-up in this study.

The Oral Hygiene Status Indices (PI, CI and OHI-S) and Gingival Index (GI) were employed to assess the patients compliance to oral hygiene instruction and motivation. At the recruitment of each patient into the study, thorough scaling and polishing with extensive oral hygiene instructions and motivations were given to them. As a result, they all maintained a low level of all these indices at follow-up examinations. A slight increase of these indices was however observed between the 3 months and 6 months follow-up examination. The reason for this could be because the patients were initially given a regular monthly oral prophlylaxis up to 3 months, after which it was repeated at 6 months. This is in keeping with the findings of Tan [32] that patients are able to maintain good oral hygiene status as long as they have regular oral prophylaxis, but as soon as they are left alone, the case reverses. This was why the importance of regular oral prophylaxis was stressed to these patients.

There were probing depths reduction in both treatment throughout the period of examination.

The probing depth reduction at one month examination was minimal for surgical and conservative treatment modalities being 0.28mm and 0.44mm, respectively. This slightly lower value for the surgical technique as against the conservative technique could be a result of the surgical intervention that causes an initial loss of probing attachment. Hill *et al* [7], Lindhe *et al* [8], Philstrom *et al* [9] and Ramfjord *et al* [33] also reported a greater loss of probing attachment following surgical therapy compared to conservative therapy on a short-term period.

The significant difference in probing depth reduction at 3 and six months (P<0.05) between the two treatment modalities might be due to better access to the implicating microorganisms and hence their near total removal. This causes continuous re-organisation of the connective tissue thus permitting less probe penetration and/or increased coronally creeping epithelial attachment. Similar result was reported by Loprez *et al* [23], who wrote that this significant difference may be because the conservative therapy only causes superficial resolution with no clinical effect in the deeper regions of the periodontal pocket. Another possible reason for this limited response to conservative therapy of these JP patients could be the ability of the micro-organisms to penetrate into the soft tissue as shown by Gillett and Johnson [24], thus making the micro-organism inaccessible to mechanical root planing and sub-gingival curettage.

However, Mattout *et al.* [34] reported a case of a 12 year old localised juvenile periodontitis (JP) patient treated conservatively and resulting in a more than exemplary improvement in the clinical parameters. Our patients in this study presented late when the disease condition had advanced and this could be the reason for the contrary result to that of Mattout *et al.* [34]. Ebersole *et al.* [35] also postulated that conservative therapy results in probing depth reduction because sub-gingival scaling may influence the production of antibodies to the periodontal pathogens in addition to the direct effect of plaque removal. Both treatment modalities gave a reduction in the degree of tooth mobility throughout the period of examination. This reduction was minimal at the one-month follow-up examination being 3.4% and 6.1% for the surgical and conservative treatment modalities, respectively. The reason for this could be because tooth mobility often occurs at about the first 10 to 14 days after periodontal surgery following flap retraction and accompanying removal of inter-dental soft tissues which actively divests a tooth of its gingival and periosteal support on a temporary basis [36]. The difference in the reduction of the degree of mobility was significant at the 6 months follow-up examination (P<0.05), this is similar to the observations of Machtei *et al* [37], Simirat *et al* [38] and Loprez *et al* [23].

The Anova summary table drawn for the probing depth and the mobility index reductions as related to subject's age, gender, type of treatment and the period of examinations shows that subject's gender does not have any significant effect on the clinical parameters while the type of treatment, the period of examination and subject's age all significantly affected these clinical parameters (P < 0.05). In this study age, however, does not appear to affect the probing depth. This significant effect of subject's age on the clinical parameters could be the reason for exemplary result reported by Mattout *et al* [34] following the conservative treatment of a 12-year-old JP girl. In this study, the age range of the patients was 15-23 years, showing that they all presented very late for treatment and the destruction would have greatly progressed at this stage.

In conclusion, we have shown in this present study that both surgical and conservative treatment modalities can be used in the treatment of juvenile periodontitis; both treatment modalities can give improvement in the probing depth and degree of mobility, although the surgical therapy gave a more significant improvement and the period of treatment and maintenance care should be determined by the extent of disease condition at the time of presentation. We therefore recommend that dental awareness of the community should be improved to encourage patient early presentation for dental check-up. All available dental facilities should be upgraded and made affordable to the patients for adequate management of these patients as some of them will need periodontal surgical treatment.

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