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USING DENTURE BASE FOR LOCAL TREATMENT WITH VIT B12 VERSUS PARENTERAL TREATMENT – A NEW APPROACH

Depending on the clinical context, objectives, and treatment requirements, a variety of prosthetic devices capable of artificially reconstructing the dental arches in a manner as customized as possible can be utilized in the treatment of complete edentation. The purpose of this study is to compare the efficacy of general vitamin B12 treatment vs the efficacy of local treatment accomplished through full dentures. The study was performed on a group of patients of Dental Faculty in Iasi.Because cyanocobalamin deficiency is typically treated parenterally, the current study proved the superiority of local treatment with complete dentures obtained through the crosslinked polymerization method, a much easier and less expensive way to perform the same treatment in the same time period.

Keyword: Dentures; Vitamin B12; Denture Base; Acrylate; Crosslinked Polymerization

1. Introduction

The stomatognathic system's homeostasis is thrown out of balance when the dental arches vanish, along with all of its occlusal drivers of mandibular dynamics [1,2]. Consequently, restoring the missing part of the body requires a revision of previous parameters, as old age's involution obscures them even further [3-5].

Nowadays, there is a trend in the many specialized publications and countless articles published all over the world to improve the treatment of the traditional complete edentation.

Dental implants are increasingly being utilized to replace missing teeth, but a traditional full denture is still the treatment of choice for many edentulous patients, both medically and financially. In addition to biocompatibility and aesthetics, a good denture base material should have acceptable mechanical and physical qualities and be biocompatible [6]. Denture bases are typically made from poly(methyl methacrylate) (PMMA) because of the material's many benefits, including its low cost, biocompatibility, simplicity of manufacturing, oral stability, and aesthetic acceptability. PMMA, or poly methyl methacrylate, is a polymer widely utilized in the dental industry, including in labs (for making orthodontic retainers and dentures and for repair), clinics (for relining dentures and temporary crowns), and even industry (for fabricating artificial teeth). PMMA is often sold as a powder-liquid combination, however its form of availability might vary depending on the application. The powder is made from a transparent polymer (PMMA), but it also contains additives like colors and nylon or acrylic synthetic fibers that alter its physical characteristics and appearance to better simulate oral tissues (such as gums, mucosa). Methyl methacrylate is the monomer in the liquid, which is also mixed with cross-linking agents and inhibitors. However, due to its poor physical and mechanical qualities, it is not regarded as a perfect material [7]. Several experiments have been done to improve the qualities of PMMA by employing alternative curing techniques and/or adding fillers to its composition. When it comes to improving the physical and mechanical qualities of PMMA, fillers and fibers are a typical strategy [8,9]. New polymerization procedures must deliver results at least comparable to the customarily authorized water bath approach while also giving better material attributes in order to compete with present PMMA production techniques [10].

Dental arches lost to edentation can be artificially recreated in a way that is as personalized as possible, based on the scenario, goals, and treatment criteria that apply in the case of total edentation [11-13]. Crosslinked polymerization using vitamin B12 as a template was used to optimize the structure of traditional

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acrylic resins and their effect on patients' overall health and local health in previous investigations [14]. This technique has a major benefit in the creation of memory sites that may be utilized to transport a variety of therapeutic medicines.

In order to compare the efficacy of parenteral vitamin B12 treatment with the efficacy of local treatment, accomplished by the complete dentures, this study intends to examine cyanocobalamin deficiency.

2. Experiment

In order to conduct the study, a group of patients from the Faculty of Dental Medicine were recruited. A total of 128 males and 124 females were in the study group, which was comprised of patients between the ages of 55 and 85. The treatment plan and study group were synthesized in Fig. 1.

2.1. Exclusioncriteria

All patients were informed and provided their permission to participate in the trial. Individuals with mental disease that affects the level of cooperation and understanding of both prosthetic and parenteral treatment were omitted from the initial group of 252 patients.

In addition, patients with gastrointestinal diseases whose primary manifestation is malabsorption and which potentially affect the outcomes of parenteral treatment were screened out.

As part of the clinical examination, each patient was given an individual evaluation form and had their maxillary and mandibular prosthetic fields thoroughly examined to determine any clinical-biological bone and mucosa indicators that were positive or negative, before the Sangiuolo classification system was used to classify each patient's prosthetic fields.Prosthetic stability and maintenance in Sangiuolo class III patients were excluded from the study because of changes in the prosthetic field, so as not to interfere with local treatment by the inability of patients to wear prostheses or by adhering adhesives to the mucosal surface of prostheses and impaired vitamin B12 release from the prosthetics.

Patients in the intermediate group were selected based on their blood count, which provided vital information about the type and amount of blood cells in the test with homocysteine and methyl malonic acid, the level of these compounds increasing as vitamin B12 levels decreased.

2.2. Final group study

So the final group of study was represented by patients with vitamin B12 deficiency-induced anemia. 3 men and 8 women in the 55-64-year-old demographic, 7 men and 10 women in the 65-74-year-old demographic, and 5 men and 9 women in the 75-85-year-old demographic were all part of the sample. In the following study we are going to analyse the 55-64 age group.

Test results for vitamin B12, methylmalonic acid, and homocysteine in the 55-64 age group are shown in the summary TABLE 1, with values in the ranges of 200-900 pg/mL for vitamin B12 and 73-271 nmol/L and 5.1-13.9 mol/L for homocysteine, respectively, indicating a diagnosis of vitamin B12 deficiency anemia.

The treatment regimen applied for parenteral treatment was as follows:

– 1 mg i.m. on days 3, 7, 10, 14, 21, 30, 60, 90,
– locally by using complete dentures correctly made, with the method of template polymerization, the template being cyanocobalamin-vitamin B12. Template polymerization is a cross-linked polymerization with acrylate and vitamin B12 as template and as a result, the denture basese became transportor for vitamin B12.

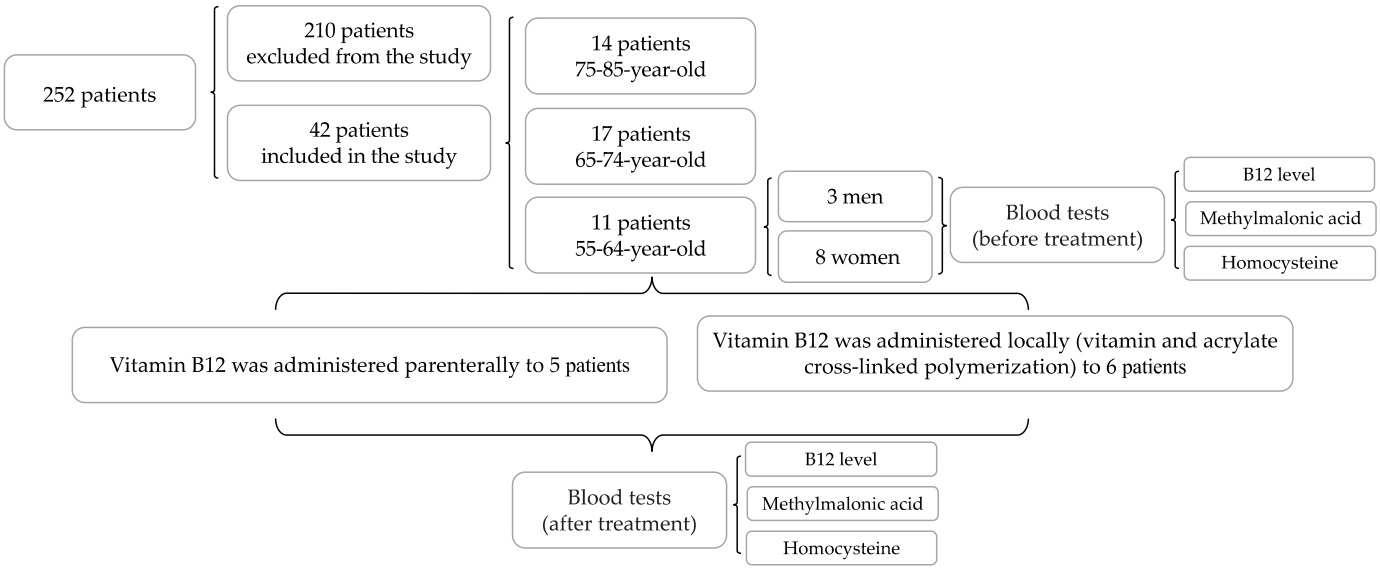

Fig. 1. Scheme for treatment plan and group study

TABLE 1

Values of the study group before treatment

Patient no.	Gender	B12 (200-900 pg/mL)	Methylmalonic acid (73-271 nmol/L)	Homocysteine (5,1-13,9 µmol/L)
1	woman	176 pg/mL	320 nmol/L	15.1 µmol/L
2	woman	152 pg/mL	345 nmol/L	15.8 µmol/L
3	woman	151 pg/mL	348 nmol/L	16.02 µmol/L
4	woman	145 pg/mL	355 nmol/L	16.31 µmol/L
5	woman	148 pg/mL	350 nmol/L	6.23 µmol/L
6	woman	123 pg/mL	370 nmol/L	16.75 µmol/L
7	woman	133 pg/mL	368 nmol/L	16.51 µmol/L
8	woman	137 pg/mL	365 nmol/L	16.39 µmol/L
9	male	165 g/mL	329 nmol/L	15.6 µmol/L
10	male	180 g/mL	310 nmol/L	14.6 µmol/L
11	male	149 g/mL	351 nmol/L	16.14 µmol/L

The recommended daily amount of vitamin B12 for adults is 2.4 micrograms. This dose can be given daily via through the denture if it is kept in a glass of water and vitamin B12 for 8 h to collect 2 mcg of vitamin B12 per day [14].

3. Results and discussion

Following the therapy administered to the group of patients, which included some administered parenterally and others administered locally in accordance with the aforesaid scheme, the analyses were repeated, and the results were summarized in the tables below by age group, as shown in the TABLE 2:

According to the statistical analysis of the data obtained for the 55-64 age group, the mean values for vitamin B12 were 157.8 g/ml, for methylmalonic acid were 339.4 nmol/L, and for homocysteine were 15.776 mol/L before the application of parenteral treatment, and the mean values after the application of parenteral treatment were 478.8 g/ml, 143.6 nmol/L.

TABLE 2

Values of study group after treatment

Pacient no.	Gender	Treatment	B12 (200-900 pg/mL)	Methylmalonic acid (73-271 nmol/L)	Homocysteine (5.1-13.9 µmol/L)
1	woman	parenteral	527 pg/mL	132 nmol/L	9.9 µmol/L
2	woman	parenteral	460 pg/mL	148 nmol/L	10.7 µmol/L
3	woman	parenteral	488 pg/mL	152 nmol/L	10.3 µmol/L
4	woman	parenteral	492 pg/mL	83 nmol/L	10.3 µmol/L
5	woman	local	653 pg/mL	119 nmol/L	9.8 µmol/L
6	woman	local	511 pg/mL	370 nmol/L	10.2 µmol/L
7	woman	local	536 pg/mL	97 nmol/L	9.3 µmol/L
8	woman	local	541 pg/mL	92 nmol/L	9.1 µmol/L
9	male	parenteral	427 g/mL	125 nmol/L	11.6 µmol/L
10	male	local	673 g/mL	80 nmol/L	9.6 µmol/L
11	male	local	528 g/mL	92 nmol/L	9.8 µmol/L

The results show an increase in B12 levels and a decrease in methylmalonic acid and homocysteine levels following parenteral treatment. We are interested in whether these differences are statistically significant. Given the above distributions, we will apply the Wilcoxon test, the nonparametric equivalent of the t test.

TABLE 3

Test Wilcoxon: a. B12 after 120d < B12 initial, b. B12 after 120d > B12 initial, c. B12 after 120d = B12 initial, d. methylmalonic acid after 120d < methylmalonic acid initial, e. methylmalonic acid after 120d > methylmalonic acid initial, f. Ac. methylmalonic after 120d = Acmetilmalonic initial, g. Homocystein after 120d < Homocystein initial, h. Homocystein after 120d > Homocystein initial, i. Homocystein after 120d = Homocystein initial

		N	Mean Rank	Sum of Ranks
B12 after 120d – B12 initial	Negative Ranks	0[a]	.00	.00
	Positive Ranks	5[b]	3.00	15.00
	Ties	0[c]		
	Total	5		
methylmalonic acid after 120d methylmalonic acid initial	Negative Ranks	5[d]	3.00	15.00
	Positive Ranks	0[e]	.00	.00
	Ties	0[f]		
	Total	5		
Homocystein after120d Homocystein initial	Negative Ranks	5[g]	3.00	15.00
	Positive Ranks	0[h]	.00	.00
	Ties	0[i]		
	Total	5		

TABLE 4

Test Statistics: a. Based on negative ranks, b. Based on positive ranks, c. Wilcoxon Signed Ranks Test

	B12 after 120d – B12 initial	Methylmalonic acid after 120d – methylmalonic acid initial	Homocysteine after 120d – Homocystein initial
Z	–2.023[a]	–2.023[b]	–2.023[b]
Asymp. Sig. (2-tailed)	**.043**	**.043**	**.043**

TABLE 5

Statistical values 55-64 years local treatment

		B12 initial	Methylmalonic acid initial	Homocystein initial	B12 after 120d	Methylmalonic acid after 120d	Homocystein 120d
N	Valid	6	6	6	6	6	6
	Missing	0	0	0	0	0	0
Mean		145.0000	352.3333	14.4367	573.6667	93.8333	9.6333
Std. Error of Mean		8.04570	9.16030	1.67076	28.67015	5.65342	.16055
Std. Deviation		19.70787	22.43806	4.09251	70.22725	13.84798	.39328

According to the Wilcoxon test, there are statistically significant differences between the final scores of the two groups as follows:

- Initial B12-B12 after 120 days (Wilcoxon: N = 5, z = 2.023, two-tailed = 0.043 ss – statistically significant).
- Initial methylmalonic acid – 120-day methylmalonic acid (Wilcoxon: N = 5, z = 2.032, two-tailed = 0.042 ss).
- Initial homocysteine - Homocysteine 120 days (Wilcoxon: N = 5, z = 2.023, two-tailed = 0.043 ss).

Following the statistical analysis of the data obtained for the 55-64 age group, the mean values for vitamin B12 145.8 g/ml, for methylmalonic acid 352.43 nmol/L and of 14.43 μmol/L for homocysteine were obtained before the application of the treatment local and 573.66 g/ml, 93.83 nmol/L and 9.63 μmol/L, respectively, as summarized in the TABLE 5:

Given the above distributions, we applied the Wilcoxon test, the nonparametric equivalent of the t test

According to the Wilcoxon test, there are statistically significant differences between the final scores of the two groups as follows:

- Initial B12-B12 after 120 days (Wilcoxon: N = 5, z = 2.201, two-tailed = 0.028 ss – statistically significant).
- Initial methylmalonic acid – 120-day methylmalonic acid (Wilcoxon: N = 5, z = 2.201, two-tailed = 0.028 ss).
- Initial homocysteine - Homocysteine 120 days (Wilcoxon: N = 5, z = 1.992, two-tailed = 0.046 ss).

The literature contains just a few research that demonstrate how to improve acrylic resin by integrating vitamin B12 into the formulation [4,5,15]. The use of dentures that incorporate vitamin B12 may be beneficial for edentulous patients who suffer from glossitis, angular cheilitis, recurrent oral ulcers, oral candidiasis, widespread erythematous mucositis, recurrent aphthous stomatitis, lichen planus and atrophic glossitis, and pale oral mucosa, which may be indicative of cobalamin deficiency [16-18].

TABLE 6

Test Wilcoxon: a. B12 after 120d < B12 initial, b. B12 after 120d > B12 initial, c. B12 after 120d = B12 initial, d. methylmalonic acid after 120d < methylmalonic acid initial, e. methylmalonic acid after 120d > methylmalonic acid initial, f. Ac. methylmalonic after 120d = Acmetilmalonic initial, g. Homocystein after 120d < Homocystein initial, h. Homocystein after 120d > Homocystein initial, i. Homocystein after 120d = Homocystein initial

		N	Mean Rank	Sum of Ranks
B12 after 120d – B12 initial	Negative Ranks	0[a]	.00	.00
	Positive Ranks	6[b]	3.50	21.00
	Ties	0[c]		
	Total	6		
methylmalonic acid after 120d methylmalonic acid initial	Negative Ranks	6[d]	3.50	21.00
	Positive Ranks	0[e]	.00	.00
	Ties	0[f]		
	Total	6		
Homocystein after 120d – Homocystein initial	Negative Ranks	5[g]	4.00	20.00
	Positive Ranks	1[h]	1.00	1.00
	Ties	0[i]		
	Total	6		

TABLE 7

Statistic results: a. Based on negative ranks, b. Based on positive ranks, c. Wilcoxon Signed Ranks Test

	B12 after 120d – B12 initial	Methylmalonic acid after 120d – methylmalonic acid initial	Homocystein after 120d – Homocystein initial
Z	–2.201[a]	–2.201[b]	–1.992[b]
Asymp. Sig. (2-tailed)	**.028**	**.028**	**.046**

4. Conclusions

It is possible that treatment will be less effective in specific categories of patients, such as those with general mental illness, digestive problems, or excessive bone resorption, who do not have the stability of prostheses and therefore do not wear them all the time.

The results of the statistical analyses conducted on the group of patients revealed that the results obtained from both parenteral and local treatment were significantly different, with the latter being superior to parenteral treatment while also being significantly easier to apply.

Our study was done to see if there was a simpler and more accessible possibility for elderly patients to receive their dose of vitamin B12 and at the same time maintain the health of the oral mucosa. The findings demonstrated that removable dentures made with crosslink polymerization and vitamin B12 might be a viable alternative. Simple to prepare and apply.

Future study will focus on whether there are any interferences in the use of this form of treatment due to patients' general conditions, age, or gender and the possibility of developing a program that includes this type of treatment and that can be applied on a wider scale than patients coming to the Clinic of the Faculty of Dental Medicine in Iasi.

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