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A comparative study between Calcium and vitamin D versus calcium and sun light exposure on bone mineral density in hemiplegic patients after stroke

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Abstract:

Background and purpose: Little information is known about the changes in bone mineral density in hemiplegic stroke patients.
The researcher compared treatment with calcium and vitamin D versus calcium and sun exposure in the improvement of bone mineral density after stroke.

Methods: The patients completed questionnaire about their age, sex, history of stroke, presence of diseases other than stroke. The questionnaire was performed face to face in the presence of witnesses. Bone mineral density was measured using DEXA for 27 patients. The patients then were divided into two groups, one group received calcium and vitamin D and the other group received calcium and were exposed to sun light one hour daily from 8 to 9 in the morning. After six months bone mineral density was measured again and the data was analyzed using SPSS version 12.

Results: The T- score for bone mineral density reveals that bone mineral density in the hemiplegic side was lower than the non hemiplegic side. In both strategies of treatment bone mineral density was improved in most cases with different degree, but the results in case of calcium and sun light exposure were better

Conclusion: Bone mineral density was reduced significantly on the hemiplegic side in stroke patients, this predisposes patients to fracture. The decrease in bone mineral density may be due to decreased sun exposure and malnutrition associated with stroke in addition to disuse of the affected part or due to mixed factors. The factors sex , age , the affected part are of significant effect on both the progression of disease and the result of treatment The administration of calcium and vitamin D or calcium and sun light exposure improved bone mineral density. The results show that calcium plus light sun exposure provide better results 71% versus 66% of that calcium plus vitamin D. The researchers recommend continuity of treatment for another six months and to follow up patient again. Also it is recommended to make benefit of sun

light exposure in treatment of reduced bone mineral density after stroke since it provides good results and is cost effective.

KEY WORDS: Bone Mineral Density (BMD), calcium, vitamin D, sun exposure, age, sex, DEXA.

دراسة مقارنة بين تأثير الكالسيوم وفيتامين د في مقابل الكالسيوم والتعرض للشمس على كثافة العظم لدى مرضى الشلل النصفي بعد الإصابة بالجلطة الدماغية

ملخص: السكتة الدماغية مرض يصيب الكثير من الناس و له العديد من الأسباب والمضاعفات الثانوية. إحدى هذه المضاعفات هو نقص كثافة العظام

في هذا البحث كان الهدف هو دراسة مقارنه بين تأثير الكالسيوم مع فيتامين د مقابل الكالسيوم و أشعة الشمس و ذلك لتحسين كثافة العظام لمرضى الشلل النصفي المصابين بالسكتة الدماغية. لهذا الغرض أجريت هذه الدراسة الإكلينيكية على (27) مريض كلهم يعيشون في غزة و محافظة شمال غزة حيث تم تشخيصهم أنهم مصابون بالشلل النصفي بعد السكتة الدماغية وكلهم عولجوا في مستشفى الوفاء للجراحة وإعادة التأهيل التخصصي .

عند بداية الدراسة اخبر المرضى عن طبيعة الدراسة، ثم قام المرضى بتعبئة استبيان حول جنس، عمر، تاريخ المرض و المتغيرات الأخرى ذات العلاقة بالدراسة . ثم أخذت البيانات الأولية باستخدام جهاز امتصاص أشعة مزدوج الطاقة لمنطقة أقصى الساعد. ثم قسّم المرضى إلى مجموعتين أحدهما عولجت بإ استخدام الكالسيوم مع فيتامين د والأخرى عولجت بالكالسيوم مع التعرض للشمس لمدة ساعة يوميا (8- 9) صباحا و استمرت فترة العلاج ستة شهور و في أثناء ذلك كان الباحث يلتقي مع المرضى شهريا ليعطيهم عبوة علاج جديدة و يزورهم في البيت للتأكد أن المرضى يستخدمون العلاج بشكل منتظم. و بعد ستة أشهر خضع المرضى لنفس الفحص الأول بنفس النظام و على نفس الجهاز وتم تجميع البيانات النهائية في جدول و تم تحليلها باستخدام برنامج الإحصاء للعلوم الانسانيه النسخة(12).

أظهرت النتائج انه وجد تحسن في كثافة العظام عند 71% من المرضى الذين استخدموا الكالسيوم وتعرضوا للشمس بينما 66% تحسنوا من الذين استخدموا الكالسيوم وفيتامين د.

في كلا الحالتين حدث تحسن في كثافة العظام و لكن المرضى الذين استخدموا الكالسيوم وتعرضوا للشمس تحسنوا بشكل أفضل.

أوصت الدراسة للوقاية من حدوث نقص في كثافة العظام لمرضى الشلل النصفي بعد السكتة، ينصح بالذات في ضوء الوضع الاقتصادي السيئ في قطاع غزة استخدام الكالسيوم و التعرض اليومي لأشعة الشمس ، وكذلك أن تعمل دراسة أخرى على عدد اكبر من المرضى و أن تستمر لفترة أطول.

الكلمات المفتاحية: كثافة العظم : الكالسيوم فيتامين د التعرض لأشعة الشمس الجلطة الدماغية الشلل النصفي.

A comparative study between calcium and vitamin D versus

Introduction

Stroke results in a lot of complications which may be acute or subacute late. From the late complications is the decrease in bone mineral density. This has been attributed to disuse of the hemiplegic side and deprived sun exposure and vitamin D deficiency[1,2,10,14,18].

The progress of the bone density in the paretic side has not been fully determined.

In this study bone mineral density in the distal forearm in the hemiplegic and non hemiplegic side was examined and comparison between calcium and vitamin D versus calcium and sun exposure in the improvement of bone mineral density was performed [10,11].

Methodology

The study was designed as randomized clinical trial and started from October 2006 until April 2007. The study was performed on 27 patients with history of stroke 4 months, all patients were followed up in El-wafa hospital in Gaza. The inclusion criteria were all hemiplegic patient followed in El-wafa hospital with age ranging between (35-60) years , and the exclusion criteria were patients below 35 or more than 60 years of age with history of the stroke less than four months, or other medical conditions or use other drugs that affect bone mineral density. At the beginning of the study, bone mineral density of the forearm was measured in the hemiplegic and non hemiplegic side using Dual Energy X- Ray Absorptiometry to obtain the baseline data. The patients then were divided into two groups randomly. The patients in the first group (composed of 14 patients with odd numbers) received a fixed dose of calcium citrate equivalent to (200) mg elemental calcium and (200 I.U) vitamin D_3 as cholecalciferol. The second group (composed of 13 patients with even numbers) received a fixed dose of calcium citrate equivalent to (200) mg elemental calcium and informed to expose to sunlight one hour daily (8-9) in the morning. All the patients were informed about the nature of the study and completed a questionnaire concerning their sex, age, diet, sun exposure and other factors that may affect the study results. The questionnaire was done face to face in the presence of witnesses. The protocol of the study was approved by HELSINKI committee of the ministry of health in Palestine. After six months (end of the study) all patients underwent a second bone mineral density examination by the same way and device used at the beginning of the study to obtain the final data. The analysis of collected data was carried out using the statistical package for social science (SPSS) version 12. The steps of data were, questionnaire coding, taking (BMD) before and after treatment, data entry and cleaning, frequency tables, cross tab, T-test and

NPAR Welcoxon test. The paired T – Test was used to asses the difference between means of the two patient groups. NPAR rank test was used to determine the relation between the therapy used and the improvement in bone mineral density. The P<0,05 were considered statistically significant.

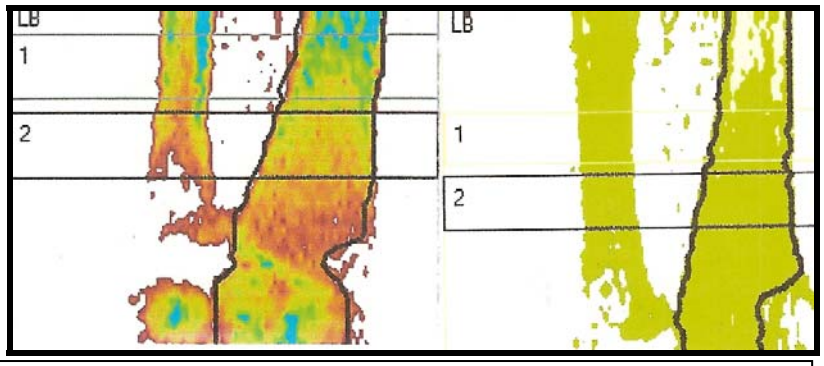

Figure 1: Dexa result seen in a hemiplegic patient on both side

Results and Discussion

In this randomized clinical trial, administration of calcium plus vitamin D resulted in improvement in 67% patient and 33% patients worsen, while in case of calcium and sun exposure resulted in increase in bone mineral density (BMD) in 71% patients and 29% patients worsen at the end of the treatment[5,10,12] . The improvement in BMD was in both the paretic side and non paretic side but it was better in the paretic side. The improvement using calcium and sun exposure was better than calcium and vitamin D and reached the statistical significant. In some patients the improvement in bone mineral density was 80% compared to the baseline data. The reason that sun exposure gave better results is that the sun rays activate vitamin D present in the body while if it is administered orally a part of vitamin D may be lost due to food interaction or other factors[13,16,17]. The therapeutic efficacy of sunlight and vitamin D has been demonstrated in the improvement of bone mineral density in hemiplegic patients after stroke. This study showed that a reduction in bone mineral density in both
hemiplegic and non hemiplegic side after occurance of stroke but this was higher in the hemiplegic side. The higher reduction in the paretic side is attributed to deprived sun light exposure in addition to disuse of the affected part[,3,4,5,13,14]. Also it was clear that the time elapsed from onset of stroke played an important role in the reduction in bone mineral density in bone mineral density , the longer the history of stroke the higher the reduction, this may be due to longer time of deprived sun exposure and

disuse of the affected part in addition bad nutrition due to psychologic factor or presence of all these factors together[9,13]. The age of patient is very important factor, since body build up and metabolism is reduced in older age people. In this study there was improvement in BMD in both age groups, but it was better in the younger age group as it appear in the diagram below. Also the reduction in BMD is also higher in older age groups[5,7,8].

The effect of sex on the BMD was pronounced as seen in Table I, The reduction in bone mineral density was more pronounced between females than between males, while the improvement in males was better than in females, this was also clearer in women after menopause. This is due to the effect of estrogen hormone on bone formation. After menopause females lose estrogen hormone that leads to an increased weakness of bone in postmenopausal women [8,15,17].

The affected part is very important factor, most patients were affected in the left side of the body, also improvement was better in the affected side of the body. This may be due to the focused attention of therapist and patient on the affected part during rehabilitation program or during normal life activities. Exercise in addition to treatment provides significant improvement in bone mineral density.

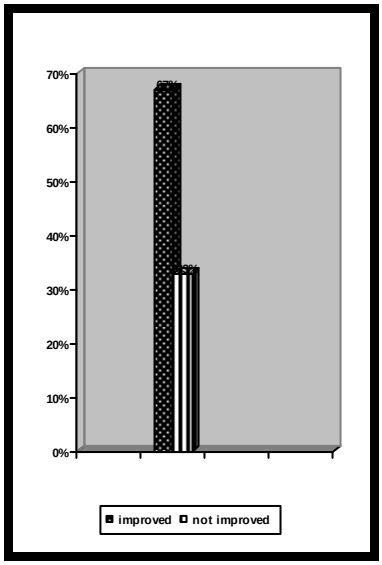

Diagram 1: Bone mineral density after calcium and vitamin d therapy

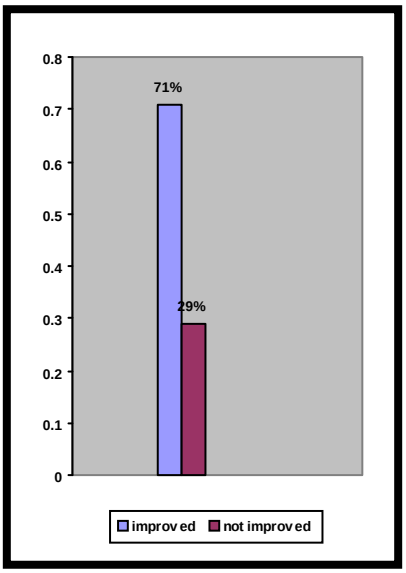

Diagram 2 Bone mineral density after calcium and sun exposure therapy

Table I: The effect of Sex on bone mineral density regardless of treatment

Variable	Distribution	Number	T –score before treatment (-1,01to -2,5)	T –score after treatment (-1,01to-2,5)
Sex	**Male**	**8**	50%	12,5%
	Female	**13**	77%	62%

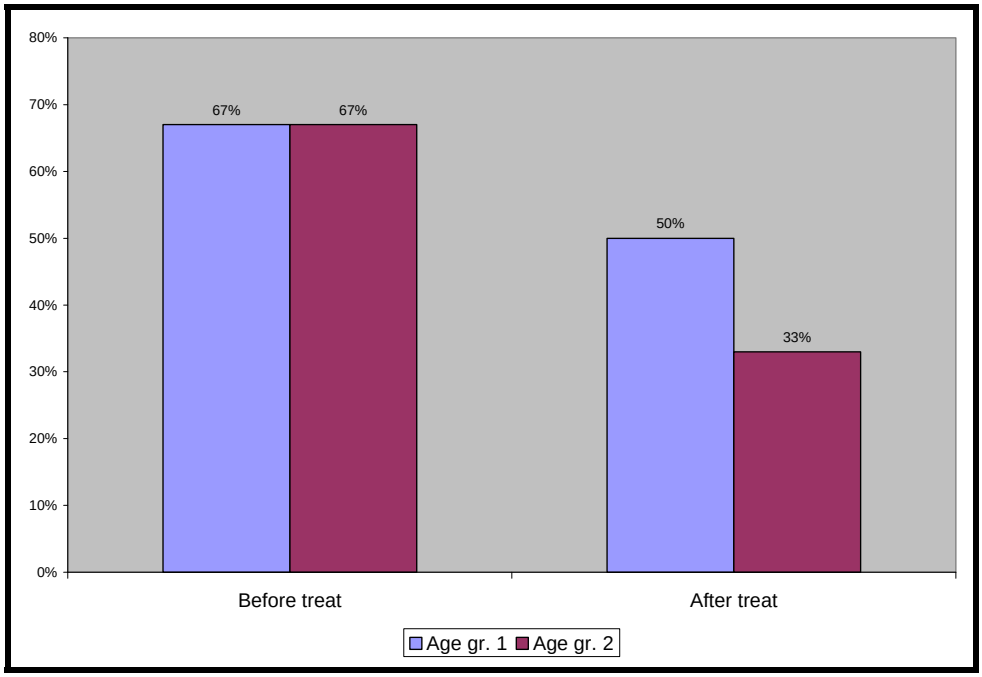

Diagram3:The effect of age group on bone mineral density regardless of treatment method

Age gr. 1 age (35 – 48y)

Age gr. 1 age (49 – 60y)

Conclusion

As a result of prolonged disuse and deprived sun exposure there was a reduction in bone mineral density in the hemiplegic side and the non hemiplegic side but this was higher in the hemiplegic side.

Treatment with calcium and vitamin D or calcium and sun exposure increased BMD after 6 months of treatment in hemiplegic patients but it was better in case of calcium and sun exposure.

The long term effect of the therapy requires further investigation

The effect of age, sex, and the history of the disease was also pronounced

Recommendations

It is recommended to use of calcium plus vitamin D or calcium plus sun light exposure for the prevention and treatment of reduced bone mineral density after stroke, but longer periods of treatment may be needed.

It is recommended that this clinical trial be repeated on all patients in Gaza strip in the future to find the main effects of stroke on hemiplegic patients.

To compare the results it is also recommended to make further investigations on patients with comparable diseases which leads to disuse and inactivity and bone mineral density reduction.

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