

Pre and post test clinical trial to assess the efficacy of tila (sesamum indicum linn.) Rasāyana in osteoporosis

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Abstract

BACKGROUND: Osteoporosis is a condition that deteriorates the micro architecture of bone often resulting in fracture. It makes the density of bone low. It affects quality of life of the patients. According to recent research data the prevalence rate of osteoporosis in Indian women is 29% and worldwide, 1:3 women and 1:5 men over age 50 will experience osteoporotic fractures. The treatment options available in contemporary medicine also are not that available or affordable to majority of Indian population. Hence an easily available, affordable treatment which can be taken rather as a food than as a medicine is very much needed in current scenario. Hence “pre and post” efficacy study of Tila Rasāyana in osteoporosis was done.

MATERIALS AND METHODS: Pre and post-test clinical trial of tila Rasāyana was done on osteoporotic patients whose bone density was more than -2.5 in peripheral DEXA and who were aged between 35-65 years. The intervention includes a Virechana (therapeutic purgation) followed by intake of sesame for one month. Both before and after the trial assessment were done on t score, Serum ALP, Serum Calcium and Quality of life (QOL).

RESULTS: The study showed statistically significant improvement in QOL and Serum ALP and insignificant result in Serum Calcium and t scores within this one month of Tila rasayana

DISCUSSION AND CONCLUSION: Tila helps in reducing Vata (a biological humour). The tila Rasāyana brings nourishment to body and improve bone health. An in-vitro study result states that sesamin a major lignan in sesame stimulate osteoblast differentiation through p38 and ERK ½ MAPK signalling pathways. Hence this trial can be concluded as an effective management in the treatment of osteoporosis.

Key Words: Tila Rasāyana, Osteoporosis, Asthikshaya, Ayurveda, DEXA scan, Sesamum indicum.

Introduction

Osteoporosis is defined by the World Health Organization (WHO) as a bone mineral density of 2.5 standard deviations or more below the average value for young healthy womenⁱ as measured by dual-energy X-ray absorptiometry. It is the micro architectural deterioration of bone results in loss of its strength. This easily results in a fractureⁱⁱ. Its prevalence is so high, and currently 200 million population worldwide is estimated as osteoporoticⁱⁱⁱ. To be more precise, one out of 3 females and one out of every 5 males world-wide is the victim of an osteoporotic fracture; and 29% of women in India are having osteoporosis^{iv}. The mortality and morbidity associated with this disease is a big concern. Besides marked decline in bone density, it affects the quality of life of the patients as well^v. The bone mineral density was best assessed using Dual Energy X-ray Absorptiometry. Hence it is considered as the gold standard for the diagnosis and assessment in osteoporosis^{vi}. Even though there exists many treatment for Osteoporosis, their long term effect, economical compatibility to common public etc. are questionable^{vii}. Though osteoporosis is ultimately an anatomical change, it's underlying physiological deficit need to get corrected to bring change on osteoporosis. So a study to make changes at dhatu (structural elements) level is very much needed. Ayurveda considers this disease under the term diminution to bone (asthikshaya). Its symptoms and pathological process can be best compared with Asthikshaya^{viii}. The symptoms of asthi kṣaya are asthi tōda (pricking pain over bones), śatana of danta (falling of teeth), śatana of keśa (hair fall), and śatana of nakha (falling of nails)^{ix}. Teeth are considered as the upadhatu (subtype of bone)^x. Tila Rasāyana (rejuvenation treatment with sesame seeds) is beneficial for teeth and do nourish the body^{xi}. Since teeth and bone having this mutual relation of dhatu and upadhatu, both are in asreya asreyi bandha (co-dependency) with vata^{xii}. Hence both will get complemented by Tila Rasāyana. Rasāyana (Rejuvenation) benefits man by imparting superior quality in dhātus. It is meant to reduce the pace of ageing^{xiii}. Further sesamin an active ingredient of Sesamum

indicum can stimulate osteoblast differentiation through p38 and ERK ½ MAPK signalling pathways^{xiv}. So considering all these facts Tila is been taken in this study for the management of Osteoporosis. Thus current study focuses on the efficacy of Tila Rasāyana with prior bio-purification (sodhana) in the management of Osteoporosis was reported here.

Materials And Methods

Open labelled, pre and post-test clinical trial registered under Clinical trial registry of India with registration number :CTRI/2018/01/011240 was conducted in Amrita School of Ayurveda, Vallikkavu, Kerala, after obtaining ethical clearance (No: IEC-AIMS- 2017--AYUR-272). Patients were selected for the study after evaluating their Bone Mineral Density. Those whose t score was > -2.5 were included in the study.

Materials needed for the study

Raw sesame seeds were procured from local market and was identified authentic by the taxonomists of Amrita School of Ayurveda. Medicines for snehapana (internal administration of ghee), abhyanga (oil massage) and virechana (biopurifactory purgation) were purchased from GMP certified manufacturer, Amrita Life, ISO 9001:2008 & GMP Certified Company. Informed consent was taken from all participants enrolled in the study.

Treatment Protocol: The patients received Pachana Deepana (carminative therapy) with Trikatu Churna (powder of dried fruits of Emblica officinalis, Piper longum and Zingiber officinale) 5g thrice daily for 3 days or till the attainment of Pakwa Mala Lakshana (symptoms of proper digestion, assimilation and excretion). This was followed by Sodhananga Snehapana (oral administration of ghee for purification) with Murchitha Ghritha (medicated ghee) for 3-7 days or till the attainment of Samyak Snigdha Lakshana (signs of proper oleation). Then Sarvanga Abhyanga Bashpa Sweda (whole body oil massage and sudation) for the next three days were done. On the third day Virechana was done with Gandaravahastha Eranda Thaila (medicated castor oil) 40ml with hot water. Till Sodhana (biopurification) the patients were under in-patient care. Then Samsarjana Krama (special diet schedule) according to the grade of purification was followed. 50 gram of sesame seeds (Tila) with water were given in the early morning in empty stomach for the next 30 days.

Assessment Criteria

The assessment was done on baseline and after treatment on the 31st day of Tila Rasāyana. The assessment was done on t score using Peripheral Dual Energy X-ray Absorptiometry, Serum Calcium using OCPC calorimetric analysis and Serum Alkaline Phosphatase using DGKC_SCE recommended hydrolysis procedure. Subjectively assessment were done on Quality of Life by Questionnaire developed by National Osteoporosis Foundation, Qualeffo-41.

Results

Paired t test shows significant increase in the levels of Serum Alkaline Phosphatase with p <0.01. Wilcoxon signed Rank test showed significant improvement in the QOL with p <0.001. But for Serum Calcium and t score the p>0.05 with the paired t test. This shows the tests were statistically insignificant before and after the trial.

Character	Paired Differences					T	Df	Sig. (2-tailed)
	Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
				Lower	Upper			
t_score_ BT- t_score_ AT	0.15500	0.55201	0.12343	-0.10335	0.41335	1.256	19	0.224

S. Calcium BT- S. Calcium AT	-0.17500	1.12244	0.25098	-0.70032	0.35032	-0.697	19	0.494
Serum ALP BT- Serum ALP AT	-15.500	21.76791	4.86745	-25.68770	-5.31230	-3.184	19	0.005

Table No. 1: Showing the statistical result of t score, Serum Calcium, Serum ALP

Character	Rankings	Mean Rank	Z value	Asymp. Sig. (2-tailed)
QOL A BT-AT	+ve Rank – 20 ^a -ve Rank - 0 ^b Tie - 0 ^c	10.50 0.00	-3.926 ^b	0.000
QOL B BT-AT	+ve Rank – 17 ^a -ve Rank - 2 ^b Tie - 1 ^c	10.76 3.50	-3.559 ^b	0.000
QOL C BT-AT	+ve Rank – 18 ^a -ve Rank - 0 ^b Tie - 2 ^c	9.50 0.00	-3.732 ^b	0.000
QOL D BT-AT	+ve Rank – 17 ^a -ve Rank - 1 ^b Tie - 2 ^c	10.00 1.00	-3.682 ^b	0.000
QOL E BT-AT	+ve Rank – 11 ^a -ve Rank - 1 ^b Tie - 8 ^c	6.64 5.00	-2.667 ^b	0.008
QOL F BT-AT	+ve Rank – 18 ^a -ve Rank - 0 ^b Tie - 2 ^c	9.50 0.00	-3.740 ^b	0.000
QOL G BT- AT	+ve Rank – 14 ^a -ve Rank - 3 ^b Tie - 3 ^c	10.14 3.67	-3.110 ^b	0.002
QOL Total BT- AT	+ve Rank – 17 ^a -ve Rank - 2 ^b Tie - 1 ^c	9.71 12.5	-2.817 ^b	0.005

Table No. 2 : Showing the statistical result of QOL domains A, B, C, D, E, F, G and domain total

Discussion

Tila Rasāyana is explained in ancient Ayurveda texts for the strength of teeth and nourishment of the body. The relation of bone towards teeth helps us to hypothesize the benefit of Tila rasayana in bone as well. The study results also substantiate the above fact. Tila Rasāyana administered for a month preceded with biopurification, is sufficient to bring changes to Serum ALP which is an indicator of increased osteoblastic activity. Alkaline phosphatase activity is important for the mineralization of bone and represents a useful biochemical marker of bone formation^{xv}. Sesame contains sesamin, a lignan which activates ALP¹³. Thus action of Tila Rasayana in promoting osteoblastic activity can be justified. The improvement in QOL is measured under different domains. The statistically significant results are suggestive of the fact that, with Tila Rasāyana there is increase in pains reduction, activities of daily living, jobs around the house, mobility, leisure and social activities, general health perception and mental function. Ācārya Caraka says benefits like social reverence (praṇāti), body strength (dēha bala)^{xvi} were gained after Rasāyana (rejuvenation treatment) especially if rejuvenation takes place in a confined environment (kuti prāvēśika). Thus improvement in quality of life can be said due to the impact of rejuvenation of Tila. It brings proper health without any disease with sama dhātu, sama agni, and sama malakriya ie the balanced state of structural elements, digestive fire and excretion^{xvii}. This is suggestive of providing a better life

quality index which is very much essential for a disease like osteoporosis. But insignificant statistical change in Serum Calcium and t score suggest that bone formation was not adequately took place. So the bone resorption to bone formation process was not go hand in hand with the one month schedule of Tila Rasāyana. Eventhough Serum Calcium is not showing statistically significant improvement, there is improvement in pre and post mean. Sesamum indicum contains Calcium^{xviii}. By the rule vṛddhi samānai sarvēṣām, (similar increases similar), Calcium in sesame increases Calcium in bones. In the previous studies the follow up time fixed for assessing a change in Serum Calcium with medication needs once in a week for eight weeks orally, or in every third month intramuscularly^{xix}. Dāruṇa is the quality of vāta (movement factor) by which it do śōṣaṇa (dryness) and bring kaṭhinata (hardness). This kaṭhinata can be compared to the density of asthi dhātu^{xx}. Again dhātu vyūhana (nourishing of dhatu) is the function of normal vāta, by which sthāyi dhātu (stable dhatu) will get nourished^{xxi}. This can result in an increase in bone mineral density after Tila Rasāyana. Generally a typical remodeling cycle, resorption takes ~7–10 days, whereas formation requires 2–3 months^{xxii}. Here, in this study we have taken the assessment in 4 weeks because the time needed for the transformation from food to last dhatu is said as one month^{xxiii}. But with the present study it is not found to be a sufficient time to make change in serum calcium or t score.

Regarding the line of management in breaking the pathogenesis of osteoporosis has been discussed hereafter. The treatment protocol adopted was helped in bringing srotosudhi (clarity to channels) which may help in properizing the pathways of bone formation and it nourishes asthi dhatu. Śōdhanāṅga snēhapāna helps in snēhana (oleation) and evacuation of dosas (śōdhana of dōṣas)^{xxiv}. Virēcana (therapeutic purgation) can channelize vata in proper routes and helps in doing its normal functions and improvement in both dhātvaṅni and jaṭharāṅni (metabolic factors)^{xxv}. Maintenance of agni is very much essential for the functioning of dhātus. In the treatment schedule for vāta, mṛdu śōdhana^{xxvi} (mild purification) with oil based medicine (snigdha) is told. More than that purīṣadhara kala and asthidhara kala is similar in nature^{xxvii}. Hence virēcana which clears purīṣadhara kala may benefit in improving asthi dhātu.

Gandarvahastādi ēraṇḍa taila used for virēcana has kaṭu rasa, uṣṇa vīrya^{xxviii}. It does vāta anulōmana and thereafter helps in curing the disease. Sesamin is a major lignan compound found in Sesamum indicum. It has the capacity to trigger osteoblast differentiation by activation of the p38 (regeneration) and ERK MAPKinase (phosphorylation of MAP and cell division of osteoblast) signaling pathway and possibly indirectly regulate osteoclast development via the expression of OPG and RANKL in osteoblasts⁸. Hence sesame may be considered as a promising drug in Osteoporosis treatment by the presence of various phytochemicals present in it. Sesame seed oil has a strong anti-oxidant activity due to the presence of lignans such as sesamin, sesamol, and sesamol^{xxix}. The presence of sesamol, sesamol and gamma tocopherol (Vitamin E) provides a high oxidative stability to Sesamum indicum^{xxx}. Thus sesame helps in preventing the deleterious effects of oxidative stress produced on osteoblast and osteocyte and this may attribute rasāyana guṇa to it. Thus following asthi poshaka (conducive to bone) tila Rasāyana helps in breaking the dhatu kshayajanya (bone depleting), vata pravruddha (increased vata) samprapti of osteoporosis.

Conclusion

Tila Rasāyana administered with prior sodhana is found to be statistically significant in increasing Serum ALP and all domains of QOL. This treatment protocol is not found statistically significant in increasing Serum Ca, and t score of pDEXA scan within the stipulated study duration. Thus Tila Rasāyana can be suggested as a cost effective, easy to administer medicine for Osteoporosis. But the same protocol if continued for two more months it may even bring statistical change in bone density as well. Hence we can conclude that altogether Tila Rasāyana is effective in managing osteoporosis.

Limitations of the study: Sample size is less to make a conclusive statement regarding the efficacy of Tila Rasāyana in osteoporosis. Hence further study can be planned in a wider study population. Limited trial duration and absence of follow up affects the efficacy of outcome assessment.

Conflict Of Interest: None

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