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Ginger and Osteoarthritis

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1. Introduction

Ginger has been used for 1000s of years as a food and medicine; it is likely one of the most ancient remedies valued by humans. Ancient Indian and Chinese cultures reportedly used ginger for a wide variety of conditions and modern day research has found it effective as an anti-emetic and anti-inflammatory agent, when taken internally. Random controlled trials using ginger extract have been found effective in relieving symptoms of osteoarthritis. Osteoarthritis is the primary cause of musculoskeletal pain and disability in Western cultures. Current management is primarily through the use of anti-inflammatory and analgesic medication, with cortisone injections and joint replacements a final resort. There is a need for a self-administered, non-toxic, natural therapy that relieves osteoarthritis symptoms, with none of the disadvantages of conventional medication or surgical procedures. A treatment is needed to control symptoms that are: easy to administer, using minimal materials, comfortable to receive, with no known side effects. People with osteoarthritis require a simple treatment that supports the management of chronic pain, relieves their anxiety and improves mobility.

This chapter introduces the significant effect on osteoarthritis symptoms, when ginger is applied externally rather than ingested internally. Four aspects are discussed: 1) ginger for arthritis, 2) ginger qualities and characteristics, 3) ginger for osteoarthritis and, 4) management and ginger therapy.

2. Ginger for arthritis

2.1 Indian medicine

Ginger is one of the significant medicinal plants used in ancient Indian Medicine. It is found effective internally, when used in food preparation and herbal extracts and externally as a ginger compress or mixed with oil to massage around the joints (Chopra, Saluja et al., 2010; Ernst, Pittler et al., 2006). Ayurveda is the term given to indigenous Indian medicine that uses the concepts of prana, prakriti and dosha to understand illness. Prana manifests as movement and energy, it is the source of all existence. Prana healing is a re-vitalising of the body, mind and soul, the basis of ayurveda. Prakriti relates to the constitutional type, while dosha to the bodies elemental forces or energies. There are three dosha: 1) vata dosha relating to space and air, 2) pitta dosha to fire and, 3) kapha dosha to a combination of water and earth. When all three dosha are in balance the body is in good health. Ayurveda

medicine refers to osteoarthritis as sandhivata from the Sanskrit 'sandhi' for joint and vata for vata dosha. People with osteoarthritis are understood to have an imbalance of vata dosha that often leads to worry and anxiety, insomnia and cramping in the body, with a decrease of fluidity and increase of catabolic activities in the joints. In osteoarthritis there is a striving to rebalance the tired body and strengthen the digestive and metabolic systems. Ginger is considered to be a plant with qualities to rebalance symptoms of osteoarthritis. Ayurveda treatments are holistic using natural remedies from medicinal plants and minerals accompanied by changes in diet and life style.

2.2 Chinese medicine

Traditional Chinese Medicine (TCM) is a unique medical system using distinct terminology and understanding alongside the use of herbs, acupuncture and moxibustion. TCM involves differentiating the causes such as; emotions, climate, diet and injuries as well as selecting the most effective medicinal herb for a given condition. Since ancient times, ginger has been taken internally and used externally in China, often as a compress, patch or in combination with moxibustion (Lai, Chen et al., 2007; Wu, 2002; Xinangcai, 1998). '*The yellow emperor's classic of internal medicine*' written about 1000BC by a number of authors referred to as Huangdi, provides the first description of ginger rhizome's medicinal use as a warming, stimulating agent. TCM refers to Chi, prana in ayurveda, the universal life force that is the source of all warmth and energy. Chi's continual movement and variation in the natural world, including medicinal plants and the human body leads to the two opposing and interdependent poles of yin and yang; yin relating to the cold, dark, contracting forces and yang to the warm, light, expanding forces. The kidneys are the root of Chi, and the yin and yang of the body. In illness Chi becomes blocked and needs to be brought back into balance. Ginger's qualities are considered to activate stagnating Chi, dispel cold and strengthen yang, where there is a predominance of yin activity as in osteoarthritis. Excessive cold and fear drives Chi downwards in the body leading to kidney/bladder weakness and bone atrophy. People with osteoarthritis tend to have an aversion to cold and suffer from injured and atrophied joints. Ginger is often the herb of choice and is used in combination with moxibustion or other warming herbs, as a compress and/or taken internally as a herbal extract for osteoarthritis.

2.3 Macrobiotics

Traditional Chinese medicine was brought to the West as macrobiotic healing by George Ohsawa in the late 1940's. Ohsawa's students travelled to France, Spain and Germany. In 1950, Michio Kushi went to the U.S.A., where his books introducing macrobiotics were published (Kushi, 1978, 1985). In Europe and the USA, the East West Foundation is committed to introducing macrobiotic medicine that requires understanding of oriental medicine, with treatments involving diet, life style, exercise and medicinal plants. Macrobiotic medicine classifies arthritis according to the cause, which dictates the treatment approach. Yin arthritis is caused by excessive intake of yin forces for example through the intake of certain foods, such as fruits, sugars and plants from the nitrate family, while yang arthritis is caused by excessive intake of yang foods, such as meat, eggs, salt and dairy products. Both yin and yang arthritis are understood to be aggravated by excessive oil and fat from both animal and vegetable sources, with ice cream being claimed as one of the major contributing causes of arthritis (Kushi, 1978). Ginger is often taken internally for yin

arthritis because of its strong yang qualities, while ginger compresses are used both on the abdomen and back to warm the body and stimulate the metabolism in both forms of arthritis. Arthritis is understood to be related to metabolic disturbances and when chronic intestinal stagnation is a contributing cause the ginger compress is often applied over the abdomen (Beere, 2000).

2.4 Anthroposophic medicine

Anthroposophic medicine was founded in the Ita Wegman Clinic, Switzerland in 1923 under the guidance of Dr Ita Wegman (1876-1943) and inspired by the ideas of Rudolf Steiner (1861-1925), an Austrian scientist, philosopher and mystic (Steiner & Wegman, 1925/1967). In 2010, in Europe there were at least 25 hospitals and clinics specialising in Anthroposophic medicine. Anthroposophic medicine takes cognisance of Ayurvedic, Traditional Chinese, herbal and allopathic medicine, with spiritual insights from the ancient esoteric and Christian religions. It is an integrative healing approach that encompasses the understanding there is an interrelation between the physical, life and emotional/sense being of people, which is interwoven by an individual inner organisation and life biography (Evans & Rodger, 1992; Therkleson, 2007). The physical is associated with the mineralising processes of the bone and cartilage, the life with the moving fluids that are most evident in the posture, the emotional with nervous and sensory perception, and the individual inner organisation, with the warm blood. This theoretical understanding finds expression in imbalances of different health conditions. For example, osteoarthritis develops, when the physical and life being is weakened in the joint(s), the sense being increases its activity causing additional tension and pain, while the individual organisation deteriorates and withdraws allowing excessive degeneration to continue unmanaged. The kidneys are considered very important metabolic organs in managing arthritis symptoms primarily due to their involvement in the movement of the blood and the assimilation and excretion of minerals in the body fluids. Typically in osteoarthritis, external treatments are selected to re-enliven and stimulate the metabolic region, such as warm sulphur baths and ginger compresses over the kidneys.

In Ayurveda, Traditional Chinese, Macrobiotic and Anthroposophic Medicine the relationship between a therapeutic plant substance and that of a potential recipient is significant. Ginger is regularly chosen as the herb of choice for people with osteoarthritis due to its warming and stimulating qualities. The qualities and characteristics of ginger are discussed in the following section.

3. Ginger qualities and characteristics

Zingiber officinale (ginger) comes from the zingiberaceae family, which has 1300 species of which about 90 comprise the zingiber species. *Zingiber officinale* is the only medicinal plant in the zingiber species. Ginger's rhizome has been used since ancient times as a food and a medicine. It is taken both internally and externally for a variety of effects including carminative, anti-spasmodic and anti-inflammatory (Blumenthal, 1998; Castleman, 2001/2003; Ferry-Swainson, 2000; Newall, Anderson et al., 1996). The rhizome is the medicinal part of ginger and it contains: 4 - 7.5% oleoresin such as gingerols and their related dehydration products known as shogaols, 1 - 3.5% of volatile oils primarily sesquiterpenes such as bisabolene, zingi-benene, camphene and acurcumene, 6 - 10% lipids comprising triglycerides,

phosphatidic acid, lecithins and free fatty acids, 9 - 10% proteins and 40 - 60% carbohydrates in the form of silicate starches. Pharmacological and experimental studies have found the active principle of gingerols and shogaols have anti-inflammatory and anti-emetic qualities (Chrubasik, Pittler et al., 2005). Ginger rhizome is cultivated widely for commercial use in the warm, moist, tropical areas of Africa, Australia, China, Fiji, India, Indonesia and Sri Lanka. People purchasing and using ginger rarely have the opportunity to observe its cultivation and even more uncommon is the sighting of *Zingiber officinale* flowers. The following description of the ginger plant, with a brief summary of its specific features in relation to its therapeutic use is an introduction to this unique healing plant. The photos were taken, whilst on an organic ginger farm in Northern Queensland, Australia.

3.1 Rhizome

The ginger rhizome is a spreading bulbous, stem that develops horizontally close to the soil surface. It forms regularly spaced buds that grow to either shoots or new rhizomes. The rounded fresh buds are about the size of a knuckle, and coloured soft lemon-green, with a fleck of pink. A freshly prepared rhizome reflects these colours in Fig 1.



Fig. 1. Fresh rhizome

The ginger rhizome has a pungent aroma, smelling fresh and sweet, and tastes hot, with a sharp and awakening effect. The rhizomes are harvested, when the leaves start to dry and contract in the winter period as shown in Fig 2. It is the rhizome that concentrates ginger's nourishing, healing and reproductive qualities. Ginger is propagated in spring from stored rhizome stock of the previous year.



Fig. 2. Ginger harvest

3.2 Root

Long tap roots grow from the seams of the lower buds and anchor the plant deep in the earth. These tap roots reach to about 80cm and are milky-white, strong and juicy; tasting rather like ginger radishes. The tap roots have few hairs and no lateral shoots. Thin, short fibrous roots also grow from the seams of the fresh buds and these are coated in loose soil and minute micro-organisms.



Fig. 3. Ginger roots

3.3 Leaf

As the shoots emerge from the rhizome buds they are their full diameter and grow upwards about 4cms a day until the stalk reaches full height at about 1.5 metres after 30 days. This growth is phenomenal and similar to that of young hollow bamboo stalks. Each mother rhizome develops between 10 - 14 stalks that are slender and erect with between 10 to 14 leaf buds on each. The lower leaf buds appear as contracted leaves, while the upper buds develop single stems that slowly unfurl into large spreading leaves. About 8 - 10 leaves rhythmically alternate up each stem and only open fully once the stalks have reached full height. The lower contracted leaf buds are a dark emerald green, while the upper buds are a soft lemon green. The upper buds open into ovate leaves that are light filled yellow-green, soft and smooth. Each leaf is between 18 - 20cm long and 3 - 4cm wide, with marked longitudinal veins running from the base to the leaf tip.

3.4 Flower

In the plant's autumn, when conditions are dry and cool the flowering buds appear. These buds are positioned on stalks that grow to about 30cms. Each mother rhizome may form between 4 - 6 flower stalks that are dwarfed by the canopy of large drying leaves. At the end of each flower stalk is a green, oval, cone-like flower bud, as in Fig. 4.

Daily in autumn, the cones relax a petal to release a small, cream coloured flower that opens at dusk. The flowers are delicate, 1cm across, orchid-like, with a distinct maroon red or purple speckled tongue, as seen in Fig. 5. It is small wonder that these flowers are rarely seen, not only are they inconspicuous being shrouded by the leaves, they also open as the sun is going down and are spent by dawn.



Fig. 4. Ginger flower cones

Ginger has specific features that relate to its selection in the therapeutic treatment of osteoarthritis. The ginger plant is robust, upright and balanced, with strong life giving forces of warmth and energy focused in the swollen stem base or rhizome. Ginger is a unique plant that stores all its reproductive, nourishing and medicinal forces in a rhizome, with the flowers and seeds being inconspicuous and often absent. Both Eastern and Western alternative medical approaches utilise the heat and vitality of the ginger rhizome in managing osteoarthritis symptoms.



Fig. 5. Ginger flower

4. Ginger for osteoarthritis

The use of ginger externally and internally for osteoarthritis likely had its origins in traditional herbal medicine. Ginger has been applied externally to relieve painful joints for over a 1000 years in India and China, often in combination with other hot herbs (Xinangcai, 1998). In

Guangzhou, China in 2006, I observed raw, grated ginger being applied to swollen ankle joints of travellers in street clinics. In TCM hospitals ginger slices were combined with moxibustion or ginger combined with other heat inducing herbs to remove blockages in the flow of chi, relieve sore joints and assist chronic chest conditions (Therkleson, 2009). For decades, ginger has been used in external therapies in specialised Anthroposophic hospitals in Europe. More recently, anecdotal experiences among groups of nurses have found the ginger footbath an effective adjunct treatment for tired, aching muscles and joints. Modern research reports random controlled trials show oral ginger extract is effective in managing osteoarthritis symptoms (Altman & Marcussen, 2001; Bliddal, Rosetzsky et al., 2000; Haghighi, Khalvat et al., 2005; Marcus & Suarez-Almazor, 2001). However, these studies claim that the high doses of ginger extract required to relieve symptoms often lead to gastrointestinal complaints. The external topical anti-inflammatory activity of dry ginger extracts from solutions and plasters looks promising, with ginger's active ingredient gingerol permeating the epidermis (Minghetti, Sosa et al., 2007). It is posited that transdermal delivery of ginger is likely as effective as internal ginger extracts in achieving an anti-inflammatory response.

4.1 Transdermal delivery of *zingiber officinale*

Herbs were first recorded as being delivered through the skin around 1550 BC in the Egyptian medical text *Ebers Papyrus*, where the crushed castor oil plant in water is applied externally to treat an aching head. Chinese sources provide directions for using ginger in combination with other medicinal herbs in a wide variety of external applications for a number of different conditions ranging from chronic chest infections, musculoskeletal conditions and metabolic disorders (Xinangcai, 1998). Transdermal delivery is defined as, 'a term that should be restricted to the situation in which a solute diffuses through various layers of the skin and into the systemic circulation for a therapeutic effect to be exerted' (Brown, Martin et al., 2006). This definition is relevant to the use of the external application of ginger in which the active ingredients, gingerols and/or shogaols have the potential to pass through the skin, enter the systemic circulation and provide a therapeutic effect. There are a number of limitations and some significant enhancers to transdermal delivery, which are relevant in the consideration of the therapeutic effect of the external application of ginger.

The primary limitation is the skin barrier. The uppermost membrane of the skin known as the stratum corneum is a thousand times less permeable to water than all the other membranes of the body. To penetrate the stratum corneum a substance must be soluble in oil and water and contain fatty acids that enhance skin penetration (Potts & Lobo, 2005). Penetration of the skin barrier is influenced by the molecular size and the quality of fat solubility of a substance. When a substance has a molecular weight <500 Daltons (Da) and lipophilicity log P range 1 - 3 it has the potential to pass through the skin (Finnin & Morgan, 1999; Guy & Hadgraft, 2003). Gingerols and shogaols, the active principles of ginger, have a molecular weight 150 - 190 Da, a lipophilicity log P range 3.5 and moderate solubility in water and oil, which suggest good potential for skin penetration (Jolad, Lantz et al., 2004; Minghetti, Sosa et al., 2007). There are three significant factors that enhance skin absorption; 1) thermal activity, 2) hydration and, 3) occlusion. Firstly, normal skin temperature is about 32 °C and, when the temperature is increased to 40 - 45 °C the closely packed lipids in the stratum corneum become more permeable. Secondly, the application of warm fluid increases the fluidity of the stratum corneum lipids, with a corresponding expansion in the intracellular spaces. Thirdly, occlusion additionally leads to increased hydration and

permeability. When the skin has a warm external compress or patch firmly pressed against it, moisture and heat become trapped and increase the swelling and opening of the intracellular spaces. Permeability of the stratum corneum by the active principles of *zingiber officinale* is likely enhanced by the use of a hot moist ginger compress or patch.

4.2 Ginger compress

European Anthroposophic hospitals report external ginger applications are effective for chest, metabolic, arthritic and psychiatric conditions, especially when applied to the kidney region (Schurholz, Vogele et al., 1992/2002). Ginger applications to the kidney region in the form of ginger compresses are found to warm and reactivate the metabolic forces of the body, which has a corresponding positive effect on the will to be active and mobile. The external application of ginger to the kidney region combines both heat and relaxation therapy and is found especially effective for people with osteoarthritis (Therkleson, 2010; 2004).



Fig. 6. Ginger kidney compress (Fingado, 2001)

The external application of ginger in the form of a compress to the kidney region was given for 7 consecutive days to 10 people with osteoarthritis. This treatment was termed ginger therapy and it involves having a warm footbath, resting 30 minutes supine, with a ginger compress in place on the kidney region (mid back), followed by a rest of 15 minutes. The ginger compress is a cotton cloth soaked in a hot ginger infusion, squeezed well so just moist and applied to the mid back. The ginger infusion comprises 10 g of ground dry ginger to 200 ml of very hot water. The recipient rests comfortably warm and quiet, on top of the compress that is held firmly in position by a thick cotton binder/towel encasing both the back and front.

Warm ginger compresses applied to the back in this manner activate the movement of body fluids and stimulate the circulation of blood, which has a corresponding positive effect on the weakened joint(s) and surrounding tissues. Following a course of ginger therapy, people with osteoarthritis describe feeling warm and relaxed. In TCM and Anthroposophic medicine, the typical person selected for an external ginger application tends to react negatively to cold, both externally and internally. The likely characteristics of a person being considered for external ginger therapy are that they experience: cold impacting negatively on symptoms, general body tension and a lack of coping skills in times of stress

(Therkleson, 2009). People with osteoarthritis often have very cold extremities, of which they are oblivious. For this reason prior to ginger therapy, a footbath using warm water is generally given to activate the body's natural warmth forces.

4.3 Ginger footbath

A ginger footbath is a fresh approach to applying ginger externally for musculoskeletal tension. This is a simple, convenient and very effective therapy. Anecdotal experiences of groups of nurses describe warmth penetrating through the body, activating a deep relaxation that enables release of mental and physical tension.

The method involves filling a deep basin with warm water and adding 10g of ground dry ginger. The ginger is mixed into the water for about 30 seconds. The recipient sits in a relaxed position for the footbath, encompassed in a warm soft blanket/sheet that is large enough to wrap around the shoulders and reach to the floor. The feet are placed in the footbath 10 minutes, as long as the footbath is experienced as warm and comfortable then dried well and warm socks put on. The recipient can rest a further 15 minutes if required.

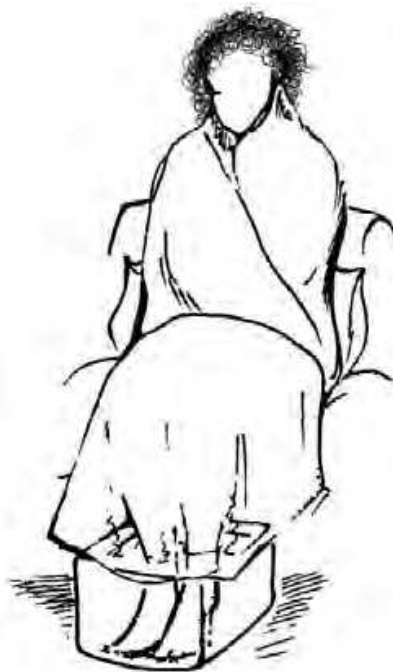


Fig. 7. Ginger footbath

The use of ginger externally is largely unexplored and, with current interest in alternative ways of managing osteoarthritis, it offers hope to those with a condition that has hitherto led to declining health and quality of life.

5. Management and ginger therapy

Osteoarthritis is a health condition that accounts for the majority of hip and knee joint replacements and lost efficacy at work and is the most common cause of musculoskeletal pain and disability in older adults in Western society (Grainger & Cicuttini, 2004). It is a condition that could be better managed, with increased understanding of human motivation

and movement. The wisdom of Eastern herbal medicine combined with Anthroposophic insights may well provide the answer towards a more effective approach. Conventional management of osteoarthritis is typically through the use of non-steroidal anti-inflammatory drugs and analgesics (Hunt, Lanas et al., 2009). These medications are often rejected by people, either due to side effects from long-term use or personal preference (Fendrick & Greenberg, 2009). Gastro-intestinal, renal, liver and cardio-vascular risk factors restrict the use of non-steroidal anti-inflammatory drugs and analgesics resulting in osteoarthritis sufferers using a variety of non-pharmacological treatments, such as exercise, heat and hydrotherapy (Grainger & Cicuttini, 2004). Rheumatologists have developed guidelines for the management of osteoarthritis after finding there is no statistically significant difference between pharmacological and non-pharmacological treatments (Zhang, Moskowitz et al., 2008). Considering non-pharmacological treatments are found so effective, more attention needs to be given to alternatives. Ginger therapy is one such non-pharmacological treatment that is worthy of further attention.

5.1 Ginger therapy

Ginger therapy involves a warm footbath, resting 30 minutes supine, with a ginger compress in place on the kidney region, followed by a rest of 15 minutes. Current phenomenological research indicates it is a potentially significant treatment in osteoarthritis. Further research is needed to assess its efficacy, with larger numbers of elderly people. In 2011, a pilot study as preparation for a full trial is commencing in New Zealand. This pilot study is evaluating the feasibility of the most suitable methods and procedures to extend ginger therapy research. Whilst there are no known side, this study will be interested in any potential adverse effects. Additionally, there is a secondary interest in the feasibility and effectiveness of using a manufactured ginger patch that can be self-applied in the home or residential setting over an extended period. A prospective study is following the pilot study and evaluate the efficacy of self-applied ginger therapy using the ginger patch for people with osteoarthritis. The ginger patch has the potential to replace the ginger compress, with the advantage of it being manufactured for convenient application both in the research and clinical situation. The ginger patch would be consistently reliable and appropriately encased in a waterproof package that is hygienically sealed from air and light.

Developing the research of ginger therapy for osteoarthritis will extend the possibility of researching its use for other relevant health conditions. Hospitals in Europe use external ginger applications to manage a number of different conditions such as: chronic chest problems, metabolic disturbances, arthritis and psychiatric conditions. Schurholz et al (1992/2002) is the only European research available and it is limited by the numbers of people involved and lack of a clearly defined methodology. Unfortunately this research has not been published in a recognised peer reviewed journal.

6. Conclusion

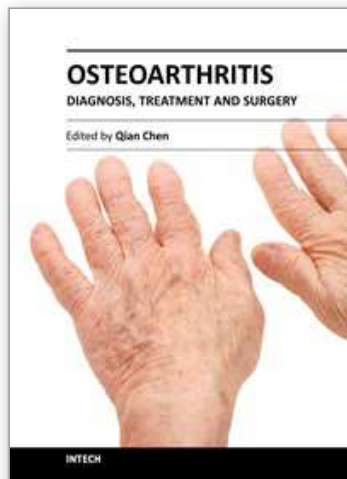
Ginger's therapeutic qualities in osteoarthritis are well grounded in the experiences of Eastern medicine and modern research trials. Evidence suggests the high doses required for a positive effect in osteoarthritis often result in digestive disturbances. The external application of ginger avoids this negative, with ginger therapy and the ginger footbath as good alternatives. Ginger is a medicinal plant with strong heat activating and anti-

inflammatory qualities, when applied to the skin in ginger therapy these qualities seem to magnify for people with osteoarthritis. Current research on the experiences of ginger therapy indicates this is a novel approach to osteoarthritis management. Further research on larger numbers of people receiving ginger therapy is necessary to advance the existing knowledge base and extend this treatment to increased numbers of osteoarthritis sufferers. Ginger therapy needs to be considered as a viable, non-invasive treatment option in caring for people with osteoarthritis symptoms. The potential socio-economic benefits are considerable and include a decrease in medication, surgical procedures and loss of working potential accompanied by improved quality of life and increased independence.

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Osteoarthritis is one of the most debilitating diseases affecting millions of people worldwide. However, there is no FDA approved disease modifying drug specifically for OA. Surgery remains an effective last resort to restore the function of the joints. As the aging populations increase worldwide, the number of OA patients increases dramatically in recent years and is expected to increase in many years to come. This is a book that summarizes recent advance in OA diagnosis, treatment, and surgery. It includes wide ranging topics from the cutting edge gene therapy to alternative medicine. Such multifaceted approaches are necessary to develop novel and effective therapy to cure OA in the future. In this book, different surgical methods are described to restore the function of the joints. In addition, various treatment options are presented, mainly to reduce the pain and enhance the life quality of the OA patients.

How to reference

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