

Wound Healing Properties of the Mediterranean Diet

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Abstract

The Mediterranean Diet has proven itself effective in acute and chronic wound healing. A Mediterranean diet includes whole grains, vegetables, fruits, fish, olive oil, red wine, and legumes. Foods studied within this diet contain high levels of antioxidants and anti-inflammatory compounds. The diversity of foods and numerous nutritional benefits maximizes wound healing with a variety of protective substances. The Mediterranean Diet has high concentrations of polyphenols, carotenoids, vitamins, and flavonoids. Additionally, foods found within the Mediterranean diet are high in protein, zinc, vitamin A, and vitamin C that specifically aid in wound healing and the body's defenses against infection. A low sodium Mediterranean Diet has also been found to strengthen the activation of macrophages to increase the tissue inflammation process and promote wound healing. The consumption of olive oil has been found to specifically lower the incidence of dermatological diseases. Specifically, olive oil also plays an important role in increased platelet function thus having a direct effect on wound healing and decreased inflammation. Our review addresses how a Mediterranean Diet aids with acute and chronic wound healing. The impact of nutrition on wound healing from a Mediterranean Diet allows for development of a nutritional approach to minimize incidence of acute or chronic, non-healing wounds via dietary changes.

Objectives

- To examine the scientific evidence surrounding the effectiveness of the Mediterranean Diet in acute and chronic wound healing, evaluating the biochemical and physiological mechanisms that underlie its observed therapeutic effects.
- The research presented here showcases the implications of zinc deficiency on chronic wounds and explores the potential of dietary zinc to prevent deficiency-related complications and expedite wound healing.
- Contrasting the Mediterranean diet with the prevalent high-sodium Western diet, our discussion will further explore how reduced sodium intake potentially augments macrophage activation and bolsters the body's innate immune response, thereby enhancing wound healing capabilities.

Background

The Mediterranean Diet has garnered considerable interest due to its holistic composition, emphasizing the consumption of whole grains, vegetables, fruits, fish, olive oil, red wine, and legumes. Despite its well-established preventative effects on cardiovascular and metabolic diseases, little attention has been paid to its role in wound healing. However, with wounds affecting 15% of patients and costing more than 28 billion dollars annually, it underscores a significant burden on individuals, healthcare providers, and facilities alike.

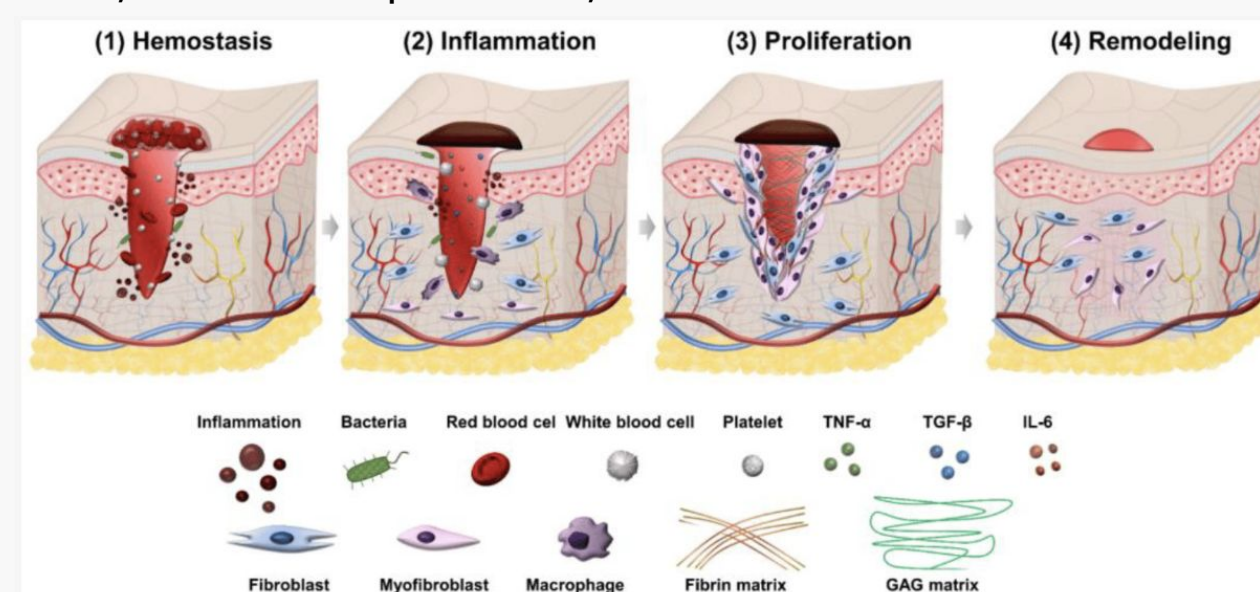


Image 1

Discussion

The Mediterranean Diet is well regarded in its cardio- and chemo-protective properties, in part due to the high antioxidant composition of the foods consumed. In this study, the wound healing properties of the Mediterranean Diet will be discussed.

Protein

Protein can be found in lean meats, seafood, eggs, beans, nuts and soy derivatives and comprises a large component of the Mediterranean diet. An evidence based analysis by the medical secretariat in 2008 looked at the treatment of chronic pressure ulcers and found that those given a very high concentration feeding tube of protein (25% concentration protein) had greater reduction in ulcer area than those given a high concentration feeding tube of protein (16% concentration protein). While attributions to increased protein supplementation in diet had been linked to better wound healing, the exact mechanism has not been elucidated.

Zinc

Zinc is a trace mineral with highest concentrations found in oysters, but also plentiful in red meats, poultry, lentils and fruits such as pomegranates; all mainstays of the Mediterranean diet. Zinc helps to maintain epithelial and tissue integrity through its free radical mechanism to inhibit apoptosis and promote angiogenesis. Zinc has a large component stored in the skin so the presence of a wound directly eliminates those zinc stores in addition to overall zinc stores being depleted leading to overall deficiency. Incorporation of zinc through foods consumed in the diet, particularly those included in the Mediterranean diet, could prevent patients from reaching deficiency and being susceptible to wound formation as well as aid in healing process however more studies need to be performed.

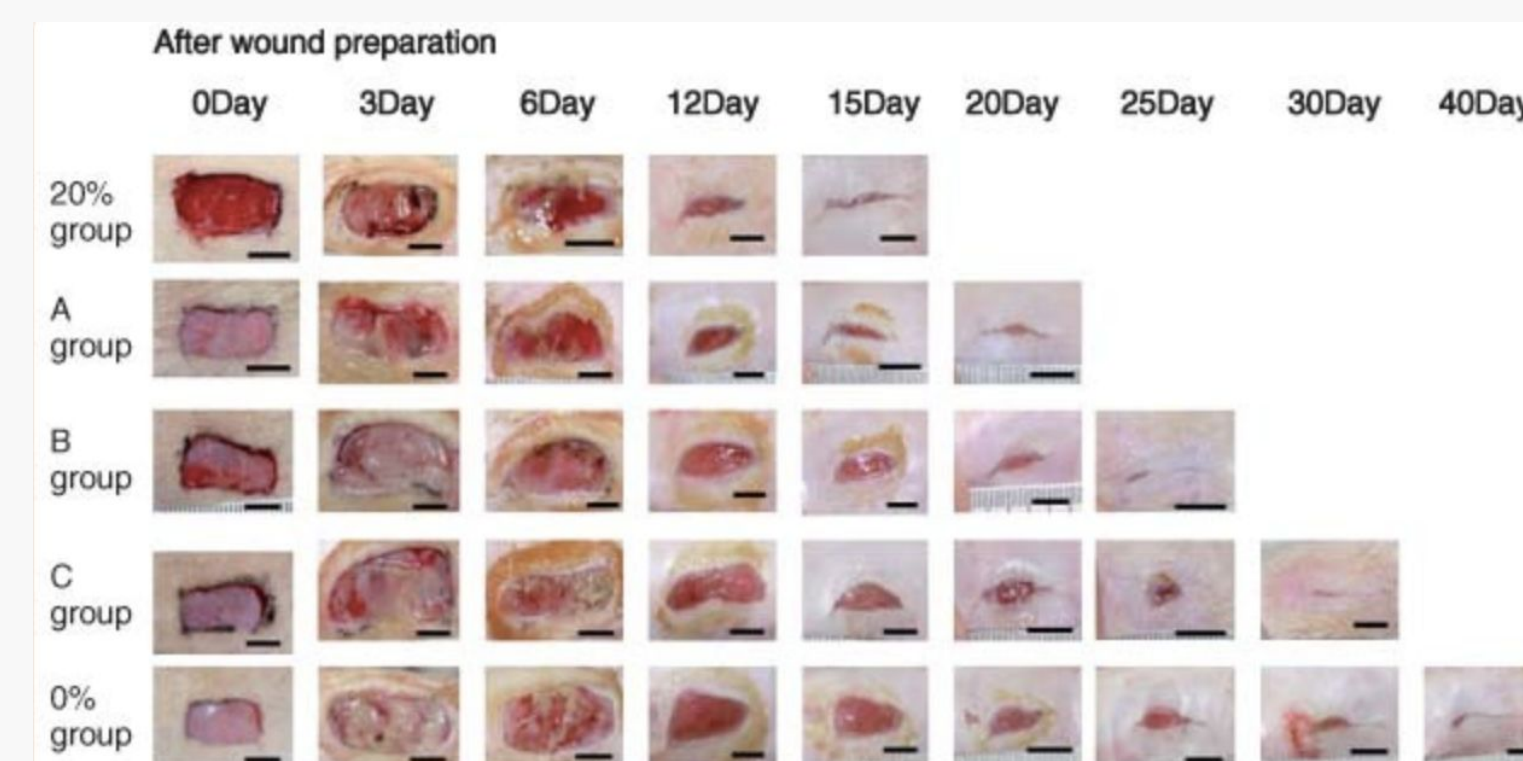


Image 2- 20% group referring to 20% casein (protein)

Vitamin A

Vitamin A is mainstay of skincare due to its powerful effects of epidermal turnover and re-epithelialization which inherently makes it beneficial to wound healing. Vitamin A can be found in leafy green vegetables, tomatoes, yellow vegetables and fruit including sweet potatoes, cantaloupe and mango. An experimental study by Lee et al. studied the use of topical Retinoic acid in wound healing and found that wound healing significantly improved due to the mechanism of activating *Arg1* which is a critical gene for tissue repair in macrophages. A study by Levenson et al. looked at how vitamin A supplementation in rats post acute radiation injury, including impaired wound healing in addition to gastrointestinal ulceration, and found that wound healing was not impaired in rats supplemented with Vitamin A and supplementation was no more or less effective whether supplemented before or after radiation.

Vitamin C

Vitamin C, also known as ascorbic acid, is a water soluble vitamin found in abundance in fruits, specifically citrus foods, and vegetables and plays an important role in skin integrity. Vitamin C is a cofactor in the synthesis of collagen, a structural protein found in abundance in the skin. A study by Gunton et al., evaluated 500 milligrams (mg) of slow-release oral vitamin C in a double-blind randomized control trial on chronic foot ulcers and found that healing at eight weeks was significantly improved in the vitamin C group. The authors of this study concluded with a recommendation that vitamin C therapy should be offered to patients with chronic foot ulcers and suboptimal vitamin C intake. With a well balanced diet such as with the Mediterranean diet, adequate levels of vitamin C will be consumed, which can further facilitate wound healing.

Phytochemicals

Phytochemicals are found in abundance in the Mediterranean Diet, as fruits and vegetables are one of the main cornerstones of the diet. Specifically, the cucumber fruit contains ethyl acetate and methanol extracts which contain antimicrobial properties, while anthocyanin found in various berries (such as strawberries, red raspberries, sweet cherries) and red onions also exhibits these properties. Resveratrol found in abundance in wine, which is consumed in moderation as part of the Mediterranean Diet, aids in the promotion of wound healing. The property of this vegetable may play an important role in wound healing to aid in infection prevention during this process.

Low sodium

A major factor in the Mediterranean Diet is low sodium, especially when compared to the modern Western Diet that boasts large amounts of sodium throughout the food items, specifically pre-packaged foods. The current recommendation from the American Heart Association is to limit sodium consumption to no more than 2,300 mg in a day, currently moving towards an ideal intake of no more than 1,500 mg a day (AHA). Wound healing is diminished in a high sodium diet due to the inhibition of macrophage differentiation; in this environment there is an increase of the development of pro-inflammatory M1 macrophages and Th17 cells and an inhibition of regulatory M2 macrophages and T regulatory cells. Adhering to the Mediterranean Diet aids in wound healing via the innate and adaptive immune response by decreasing the amount of sodium consumed.

Olive oil

The main source of fat in the Mediterranean Diet is olive oil, which is rich in omega-3 polyunsaturated fatty acids and polyphenols. A byproduct of olive oil production is alperujo extract, which contains hydroxytyrosol and 3,4-hydroxyphenylglycol (DHPG), which modulates platelet function (De Roos, B). A study by De Roos, et al., evaluated the byproduct of olive oil containing these compounds and found that alperujo extract significantly inhibited collagen induced platelet aggregation and thrombin receptor analogue peptide induced platelet aggregation at certain concentrations *ex vivo*. In wound healing, platelets have a vital function in wound hemostasis and healing; this compound may protect against platelet aggregation. More research should be done in this area on this compound, specifically *in vivo* studies and on this compound. Olive oil byproducts are often wasted; if there are beneficial effects of the byproduct they could be incorporated into the diet.

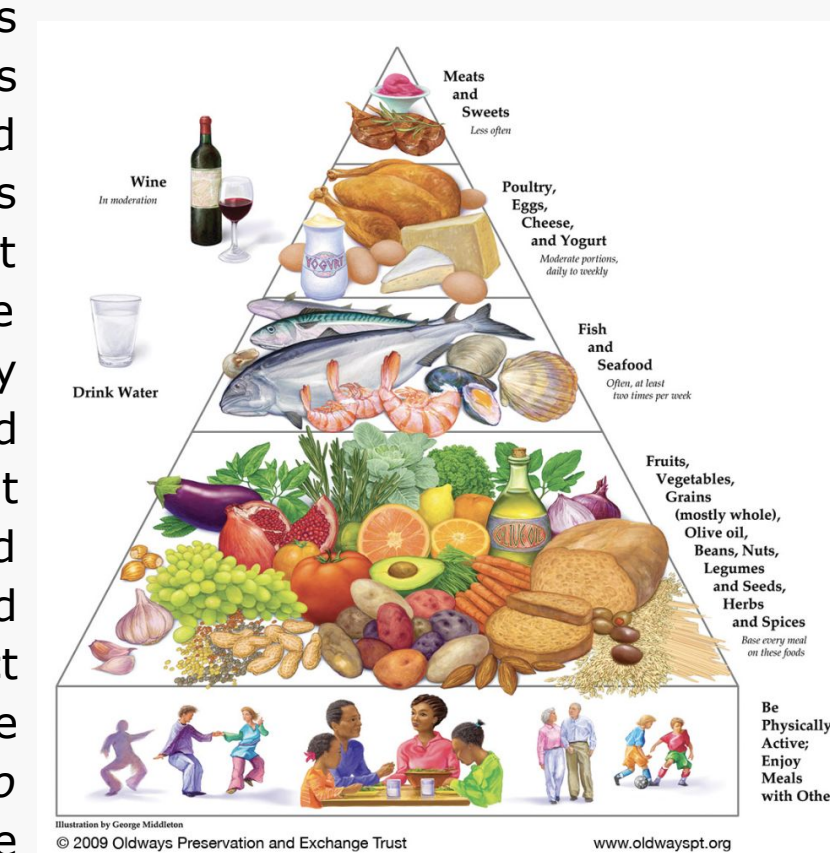


Image 3

Conclusion

- The diverse array of nutrients within this diet, such as antioxidants, anti-inflammatory compounds, polyphenols, carotenoids, vitamins, and flavonoids, collectively contribute to a synergistic effect that maximizes the body's natural healing processes.
- The inclusion of essential elements like protein, zinc, vitamin A, and vitamin C further fortifies the diet's role in promoting wound healing and bolstering the body's defenses against infection.
- A nutritional approach centered around the Mediterranean Diet emerges as a promising strategy to minimize the incidence of acute or chronic non-healing wounds, offering a scientifically grounded and holistic perspective on the crucial interplay between nutrition and wound healing.
- Further research and clinical trials are warranted to elucidate specific mechanisms, optimal dosages, and potential therapeutic applications for this dietary approach in wound care.

