The ostrigonum syndrome: A diagnosis not to be missed.

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Abstract

The os trigonum is a triangular separate ossicle located at the posterior aspect of the talus close to the lateral tubercle. During plantarflexion, this ossicle and surrounding soft tissue become impinged between the posterior distal surface of the tibia and the superior surface of the calcaneus. The incidence of the os trigonum is 3 to 15%. Its bilateral form is more common than the unilateral one. This syndrome is found mostly in ballet dancers.

Acute pain and swelling in the posterolateral aspect of the ankle are the characteristic elements of the os trigonum syndrome. Clinical examination findings can evok the possibility of this disease, but the diagnosis is confirmed by radiographs and Computed tomography showing the os trigonum. Magnetic resonance imaging may be used to rule soft tissue involvement. Initial treatment is conservative, when this later has failed to relieve the symptoms, surgical excision is indicated.

The os trigonum syndrome refers to symptoms produced by pathology of the lateral tubercle of the posterior talar process. Pain can be caused by disruption of the cartilaginous synchondrosis between the os tnigonum and the lateral talar tubercle as a result of repetitive microtrauma and chronic inflammation. Additional etiologies include trigonal process fracture, flexor hallucis longus tenosynovitis, posterior tibiotalar impingement by bone block, and intraarticular loose bodies. This pictorial essay explores the role of imaging modalities in the diagnosis and treatment of the os trigonum syndrome, a symptom corn- plex that may present difficult diagnostic problems. The symptomatic os tnigonum has variously been named the os trigonum syndrome, talar compression syndrome, posterior ankle impingement syndrome, and posterior tibial talar impingement syndrome The symptoms of os trigo- num impingement include the chronic or the recurrent pain with stiffness, tenderness, and soft-tissue swelling in the posterior ankle. Strenuous activities that result in extreme plantar flexion such as ballet, soccer, football, and downhill running can cause compression of adjacent synovial and the capsular tissues against the posterior tibia. With repeated entrapment, the soft tissues tissues undergo inflammatory change with eventual thickening and fibrosis; associated flexor hallucis longus tenosynovitis may be present.

Keywords: Hepatitis c virus (HCV) infections, Electrochemiluminescence (ECL), Anti-HCV tests, ELISA.

Introduction

Anatomy The os tnigonum may be considered developmental, analogous to a secondary ossification center, because it is formed within a cartilaginous extension from the posterior portion of the talus [1-4]. A cartilaginous synchondrosis exists between the os and adjacent talus similar to that seen between the accessory navicular and the navicular tubercle [4]. The mineralized Os trigonum appears between the ages of 7 and 13 years and usually fuses with the talus within 1 year, forming the tnigonal (Stieda) process. It may remain as a separate ossicle in 7-14% of patients, often bilateral [5]. Although the adult os trigonum appears to represent a failure of fusion of the secondary ossification center, it may not always be possible to differentiate an old ununited fracture of the lateral tubercle (so-called Shepherd's fracture) from this ossicle [6]. The os trigonum usually has three surfaces: anterior, inferior, and posterior. The anterior surface connects with the lateral tubercie by the previously described cartilaginous synchondrosis. The inferior surface may articulate with the calcaneus at the posterior subtalar joint. The posterior surface is nonarticular but serves as a point of attachment for capsuloligamentous structures, in particular the posterior talofibular and posterior talocalcaneal ligaments [2]. The tendon for the flexor hallucis longus sits medial to the os trigonum in the sulcus between the medial tubercle and the larger lateral tubercle. Activities that heavily use this tendon can exert constant pressure on the os tnigonum, resulting in tenosynovitis. Clinical Findings Forced plantar flexion of the foot may cause talar compression between the posterior tibial and the calcaneus and result in a fracture of the trigonal process or separation through the cartilaginous synchondrosis. Excessive dorsiflexion in the ankle may also avulse the lateral tubercle by increased tension on the posterior talofibular ligament [1]. The symptomatic Os tnigonum may result from an acute injury or from chronic repetitive microtrauma that leads to disruption of its attachment to the talus. Patients usually complain of pain with nation, pain is accentuated by resisted plantar flexion or donsiflexion of the great toe. Tenderness is present anterior to the Achilles' tendon and posterior to the talus. When chronic, reduced motion of the hallux may develop as a result of fibrosis of the flexor hallucis longus tendon in the fibroosseous canal between the medial and lateral tubercles [1]. Imaging On conventional radiography, the os tnigonum is usually tnangular but may appear round or oval. It is usually solitary and less than 1 cm in size but may be bipartite or even multipartite. The margins of the ossicle may be smooth or serrated [4]. With repetitive micnotrauma, irregular margination may develop on one on both sides of the synchondnosis. With continued impingement, there may be hypertnophy of the ossicle or lateral tubercle. A chronic chondroosseous disruption between the os tnigonum and the talus may result in cystic and sclerotic changes along both sides of the synchondrosis. Polydirectional tomography and CT are both capable of defining these changes and allow for diffenentiation from acute fractures. Posterior ankle impingement pain may be due to a posterior bony block caused by a large os tnigonum, a large postenolateral tnigonal (Stieda) process of the talus, or a prominence on the dorsum of the calcaneus adjacent to the posterior subtalar joint. Similarly, symptoms may develop from chronic repetitive microtrauma to the os tnigonum that results in injury to the cantilaginous synchondrosis, with subsequent chondroosseous microseparation and fibrosis. In contrast to chronic impingement, forceful plantar flexion and pronation may result in an acute fracture of the fused trigonal process of the talus or disrup tion of the synchondrosis between the os trigonum and the lateral tubercle of the posterior talar process. Technetium bone scanning has been reported to be helpful in diagnosing both the symptomatic os tnigonum and ununited posterior process fractures by demonstrating increased uptake in the region of the os trigonum. A normal bone scan virtually eliminates these diagnoses.

Literaure Review

The authors reported that rutin was degraded during mixing and about 85% was transformed to quercetin, while quercetin did not change during baking. The stability of phenolic acids and flavonoid compounds in amaranth, quinoa, and buckwheat during the bread-making process. The authors has reported the significant reduction in phenolic acid content in the bread when compared to the flour. Furthermore, the contents of flavonoid compounds such as quercetin and kaempferol glycosides in 100% quinoa breads decreased. The stability of lutein and zeaxanthin in unfortified and fortified baked products (pan bread, flat bread, cookies, and muffins) using different baking recipes and the baking conditions. Baking of a flat bread resulted in a significant reduction in all-trans-lutein: losses of about 37-41% for unfortified breads and 29-33% for fortified breads. Losses ranging from 35% to 45%, depending on the wheat species used.

The carotenoid loss during processing. Bread crumbs lost 21% of their carotenoid content, while 47% of the carotenoids were lost in bread crusts due to manufacturing. The highest losses were observed in the crust, which is exposed to higher temperatures than is the crumb. Thus, vitamin E losses of range between 24% and 47% in white breads and between 10% and 15% in the wheat and rye breads because of baking. They have found that baking losses occur due to the extractability changes in vitamin E. Most phenolic substances are concentrated mainly in the outer layer of cereal grains; using wholegrain flour during bread making therefore reduces the loss of phytonutrients and increases health benefits for consumers. Most of the studies reviewed have shown that the bread making process produces various effects on phytonutrient and antioxidant capacity. As a result, the choice of bread-making method and baking ingredients will help in producing healthful bread.

Future Consideration

Research to gain a thorough understanding of the relationships between baking methods and bread dough rheology and how they relate to improved product and nutritional quality would be significantly useful for the baking industry. Another future prospect could be to investigate the potential of sourdough to improve the stability of incorporated functional ingredients into bread formulas.

Conclusion

Whole grain products are considered a good source of phytonutrients such as phenolic compounds, tocopherols, tocotrienols, carotenoids, plant sterols, and lignans. Consumers today are interested in healthy foods; producing bread with wholegrain flour is one approach for making healthier breads as opposed to that made from refined flours. Wholegrain breads are good sources of dietary fiber and antioxidants. Thus, Wholegrain foods have been linked with reduced risk of chronic disease such as cardiovascular disease, cancer, and diabetes.

Thus, the development of improved wholegrain bread with superior quality and enhanced nutritional properties is needed to increase consumer appeal and to boost the daily consumption of wholegrain foods. Bread is commercially produced using different baking formulas and methods to produce numerous flavors, tastes, and textural properties. Duodu has reported that the different methods of the cereal processing, including bread making, may positively or negatively affect the content of phytonutrients, which in turn affect their bioactive properties and health benefits. Several methods are used in the production of bread including straight dough, sponge dough, Chorleywood process, and sourdough. Bread made from wholegrain wheat flour often has a lower loaf volume, firmer dense crumb, and darker crumb and crust compared to bread made from refined wheat flour. As a result, As a result, research has been carried out to improve the quality characteristics of wholegrain bread products using various bak- -ing methods. Sourdough the bread-making methods were more making methods were more effective in improving wholegrain bread quality compared to straight or sponge dough (yeast-leavened) methods if the appropriate amount of starter and conditions were utilized.

The optimum volume of all sourdough breads was obtained when moderate acidity was achieved in sourdough bread containing 15% starter. The bread’s improved volume and softness was probably due to the appropriate acidity, which modifies dough gluten through the enzymatic activity of flour. Furthermore, improved bread softness during storage was obtained with the sourdough bread making method. The phytonutrient and antioxidant properties of wholegrain bread could be altered during the baking process. Different baking processes would produce various reactions among ingredients during fermentation and oven baking, which causes changes in phytonutrients level and antioxidant capacity. Generally, sourdough fermentation can effectively modify the quality and nutritional properties of wholegrain bread products.

Conflicts of Interest

The authors declare no conflict of interest.

References

1. Anson NM, van den Berg R, Havenaar R, et al. Bioavailability of ferulic acid is determined by its bioaccessibility. Journal of Cereal Science. 2009;49:296-300.
2. Read A, Wright A, Abdel-Aal ESM, et al. In vitro bioaccessibility and monolayer uptake of lutein from wholegrain baked foods. Food chemistry. 2015;174:263-9.
3. Moore J, Luther M, Cheng Z, et al. Effects of Baking Conditions, Dough Fermentation, and Bran Particle Size on Antioxidant Properties of Whole-Wheat Pizza Crusts. J Agricul Food Chem. 2009;57:832-9.
4. Yu L, Nanguet AL, Beta T. Comparison of Antioxidant Properties of Refined and Whole Wheat Flour and Bread. Antioxidants. 2013;2:370-83.
5. Liu, RH. Whole Grain Phytochemicals and Health. J Cereal Sci. 2007;46,207-19.
6. Jaekel LZ, Batista C, Steel CJ, et al. Influence of Xylanase Addition on the Characteristics of Loaf Bread Prepared with White Flour or Whole Grain Wheat Flour. 2012.
7. Gómez M, Ronda F, Blanco CA, et al. Effect of dietary fibre on dough rheology and bread quality. European Food Research and Technology. 2003;216:51-6.
8. Katina K, Salmenkallio-Marttila M, Partanen R, et al. Effects of Sourdough and Enzymes on Staling of High-Fibre Wheat Bread. LWT - Food Science Technol. 2006;39:479-91.
9. Yazar G, Tavman Ş. Functional and Technological Aspects of Sourdough Fermentation with Lactobacillus Sanfranciscensis. Food Eng Rev. 2012;4:171-90.
10. Hebeda RE, Bowles LK, Teague WM. Developments in enzymes for retarding staling of baked goods. Cereal Foods World. 1990;35:453-7
11. Corsetti A, Gobbetti M, Balestrieri F, et al. Sourdough Lactic Acid Bacteria Effects on Bread Firmness and Staling. 1998;63:347-51.
12. AACCI International. Approved methods of analysis. 2011.
13. Flander L, Suortti T, Katina K, et al. Effects of Wheat Sourdough Process on the Quality of Mixed Oat-Wheat Bread. LWT - Food Science Technol. 2011;44:656–64.
14. Rieder A, Holtekjølen AK, Sahlstrøm S, et al. Effect of Barley and Oat Flour Types and Sourdoughs on Dough Rheology and Bread Quality of Composite Wheat Bread. Journal of Cereal science. 2012;55:44-52.
15. Schmiele M, Jaekel LZ, Patricio SMC, et al. Rheological Properties of Wheat Flour and Quality Characteristics of Pan Bread as Modified by Partial Additions of Wheat Bran or Whole Grain Wheat Flour. Int J Food Sci Technol. 2012;47:2141-50.
16. Chandi GK, Seetharaman K. Optimization of gluten peak tester: a statistical approach. J Food Quality. 2012;35:69-75.
17. Adams, V, Ragaee S, Abdelaal EM. Impact of Wheat Fiber on Frozen Dough Shelf Life and Bread Quality. Cereal Chemistry. 2015.

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