

Chymopapain, A hope for IVDP (Intervertebral Disc Prolapse) Patients – an alternate to the Surgery

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ABSTRACT

Chemonucleolysis is a non-surgical treatment for a bulging disc that involves the injection of an enzyme called chymopapain into the vertebral disc with the goal of dissolving the inner part of the disc, the nucleus pulposus. The chymopapain extract from the papaya plant having property to dissolve the property of dissolves the dislocated disc causing compression on the spinal nerve and gives the symptoms of sciatica. Chymopapain is a proteolytic enzyme isolated from the latex of papaya (*carica papaya*). It is a medication used to treat herniated lower lumbar discs in the spine. The treatment seemed to offer a less invasive, lower-cost alternative to surgery while achieving comparable success.

Although many patients experienced excellent outcomes, chemonucleolysis with chymopapain was found to cause serious side effects at a higher-than-expected rate. The nonspecific enzyme digested structures in addition to the disk nucleus, leading in the worst cases to hemorrhage, pain, and paralysis. In some patients, chymopapain triggered serious allergic reactions, including fatal anaphylactic shock. Serious side effects from the use of chymopapain include anaphylaxis, paralysis of the legs or death.

Due to the above reasons twenty years later—in January 2003—the FDA halted the sale and distribution of chymopapain in the United States. After taking above concept in due consideration the oil can be extracted from the papaya plant and can be tried in the form of *kati basti* and *kati pichu* to get the better result in case of IVDP and prove to be less invasive, cost

effective and one of great achievement in the field of Ayurvedic medicine if come out with successful results.

Hence, there is scope for the above said conceptual study to make it EBM (Evidenced Based Medicine) and new advancement in the field of medicine.

Keywords *Papin, Chymopapain, Intervertebral Disc Prolapse,*



Greentree Group

Received 20/2/15 Accepted 01/3/15 Published 10/3/15

INTRODUCTION

Herniated disc, while not the most common cause of low back pain, is the most common reason for surgery to relieve back pain. An alternative to surgery when sciatic pain is the result of disc herniation is chemonucleolysis with chymopapain. Since this enzyme is effective only in very specific circumstances, proper patient selection is crucial. Five criteria for selection are presented, emphasizing that since chemonucleolysis is not conservative treatment, it should be reserved for patients whose pain is unrelieved by conservative methods. There are several important contraindications to chemonucleolysis: allergy to chymopapain, risk of injury to the cauda equina, disc lesions at cord levels, pregnancy, patient's age (not recommended for adolescents) and sequestered disc.

Technique is exacting and should be limited to surgeons with the opportunity for concentrated experience.

Chemonucleolysis is a non-surgical treatment for a bulging disc that involves the injection of an enzyme into the vertebral disc with the goal of dissolving the inner part of the disc, the nucleus pulposus. The procedure uses chymopapain, an enzyme from the papaya fruit, to dissolve the displaced disc material that is putting pressure on the spinal nerve. The theory is that if chemonucleolysis can successfully alleviate back pain from a bulging disc, it could prevent the need for invasive surgery such as a spinal fusion.

Chymopapain is a proteolytic enzyme isolated from the latex of papaya (*Carica papaya*). It is a medication used to treat herniated lower lumbar discs in the spine.

Chymopapain injections are normally given under local, rather than general, anaesthesia. The dose for a single intervertebral disc is 2 to 4 nanokatal (1 U = 1/60 micro katal = 16.67 nano katal), with a maximum dose per patient of 8 nanokatal. The procedure is referred to as chemonucleolysis.

REASON FOR BANNING

The enzyme dissolved the soft, bulging disk nucleus, shrinking the disk and reducing its pressure on nerve roots. The procedure had been available in Canada and had been drawing enthusiastic patients across the border for years. U.S. Food and Drug Administration (FDA) finally approved chemonucleolysis with chymopapain; even the *New York Times* praised the decision. The treatment seemed to offer a less invasive, lower-cost alternative to surgery while achieving comparable success.

Twenty years later in January 2003 the FDA halted the sale and distribution of chymopapain in the United States. Although many patients experienced excellent outcomes, chemonucleolysis with chymopapain was found to cause serious side effects at a higher-than-expected rate. The nonspecific enzyme digested structures in addition to the disk nucleus, leading in the worst cases to hemorrhage, pain, and

paralysis. Because the enzyme's effects are permanent, disks never regained their pretreatment height, potentially impairing biomechanics. In some patients, chymopapain triggered serious allergic reactions, including fatal anaphylactic shock. Serious side effects from the use of chymopapain include anaphylaxis, paralysis of the legs, or death. Due to the legal liability from previous complications associated with the procedure, it is largely no longer available in the U.S.

- Traditional medicine in some parts of the world, papaya leaves are made into tea as a treatment for malaria. Antimalarial and antiplasmodial activity has been noted in some preparations of the plant, but the mechanism is not understood and no treatment method based on these results has been scientifically proven.



- *Carica papaya*, the widely cultivated papaya (or papaw or pawpaw), a tropical fruit tree.
- In belief that it can raise platelet levels in blood, papaya may be used as a medicine for dengue fever. Papaya is marketed in tablet form to remedy digestive problems.
- Papain is also applied topically for the treatment of cuts, rashes, stings and burns. Papain ointment is commonly made from fermented papaya flesh, and is applied as a gel-like paste. Harrison Ford was treated for a ruptured disc incurred during filming of *Indiana Jones and the Temple of Doom* by papain injections.

PAPAIN

Enzyme present in the leaves, latex, roots, and fruit of the papaya plant (*Carica papaya*) that catalyzes the breakdown of proteins by hydrolysis (addition of a water molecule).

Papain is used in biochemical research involving the analysis of proteins. A related enzyme also produced by papaya is chymopapain, which has different

characteristics of mobility and solubility; it is used to shrink or dissolve ruptured disks in certain kinds of lumbar spine injuries, and otherwise as a digestant of protein.

The amount and activity of papain isolated from the different parts of the papaya plant vary depending on the age of the tree and whether it is male or female. *For example, higher quantities of crude papain may be extracted from female trees compared with male trees and from older fruits compared with younger fruits.* However, papain extracted from young papaya fruit produced by female trees typically is more active than that extracted from old fruit produced by male or hermaphrodite plants.

Papain can trigger allergic reactions in susceptible individuals. Skin reactions may occur following contact with fresh latex.

Unfortunately, all of the research that I've seen on dried papaya has been done on a very specialized type of dried papaya called papaya pomace (which is actually more like a waste product and used almost exclusively in animal feed). Papaya pomace is basically what's left after the juice has been extracted from the papaya fruit. I've seen studies on dried forms of these papaya "leftovers," but I assume they bear little resemblance to the dried whole fruit that we would purchase in a natural foods grocery.

Enzymes, including the papain enzyme found in papaya, are heat sensitive and become denatured upon exposure to too much heat. Therefore, the heat involved with the commercial drying of papaya will deactivate its enzymes.

If you decide to buy dried papaya, it's important to remember that, like other dried fruits, it may be treated with sulfites. To avoid these sulfites, either look for dried papaya that notes that it contains no sulfites or buy organic dried papaya since sulfites are not added to organic food products. (Whether dried or fresh, I would always recommend purchasing organic papaya in order to avoid potential pesticide residues found on non-organic papaya and to take advantage of the greater nutrient benefits associated with organically-grown foods.)

It's important to remember, though, that papain is most concentrated in green unripe papaya and not ripe papaya, from which dried papaya is made. Raw papaya has a higher concentration of PAPAINE than the ripe one. Green papaya is more readily found in stores that sell Asian foods. It makes the base for a great salad mixed with red onions and hot peppers in traditional Thai style. Cut up into small pieces or grated you can add it to cold salads or use it as a sandwich topping.

Method of extraction - Papain is obtained by cutting the skin of the unripe but almost mature papaya and then collecting and drying the latex which flows from the cuts. Tapping of the fruit should start early in the morning and finish by mid-late morning (ie during periods of high humidity). At low humidity the flow of latex is low. Two or three vertical cuts, 1-2mm deep are then made, meeting at the base of the fruit. The incisions are made using a stainless steel razor blade set into a piece of rubber attached to a long stick. The blade should not protrude more than about 2mm as cuts deeper than 2mm risk juices and starch from the fruit pulp mixing with the latex which lowers the quality. Fruits should be tapped at intervals of about 4-7 days and for the first tapping it is usually sufficient to make only one cut. On subsequent tappings' the two or three cuts are spaced between earlier ones. After about 4-6 minutes the flow of latex ceases. A dish is used to collect the latex and the latex is then scraped into a polythene lined box with a close fitting lid; such a box should be stored in the shade. The use of a close fitting lid and keeping the box in the shade are both important because they reduce the reactions which cause the loss of enzyme activity. Foreign matter such as dirt

and insects in the latex should be avoided. Latex adhering to the fruit should be carefully scraped off and transferred to the collecting box. However, dried latex should not be mixed with fresh latex as this lowers the quality. When handling fresh latex, care should be taken to ensure that it does not come into contact with skin as it will cause burning. Neither should it come into contact with heavy metals such as iron, copper or brass as this causes discolouration and loss of activity. Pots, knives and spoons should not be used unless they are made from plastic or stainless steel. Fresh latex does not keep well and should be dried to below 5% moisture (when it will have a dry and crumbly texture) as soon as possible. After two or three months the fruits are ripe and should be removed from the tree. Thus, the oil can be prepared from the papaya plant and study can be carried out on the patient of intravertebral disc prolapsed with great hope of successful results and this can be big achievement in the medical field which is cheap, non-invasive and evidenced based medicine.