Pharmacologic vitreolysis of vitreous floaters by 3-month pineapple supplement in Taiwan: a pilot study

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Introduction
The vitreous is highly hydrated gel-like structure (> 98% water) that is a cellular, apart from a few cells called hyalocytes in the vitreous cortex. Besides, the gel state is maintained by a network of long thin collagen fibrils that are approximate to 15 nm in diameter. Filling the space is a network of hyaluronan; this glycosaminoglycan (polysaccharide) may attract water and generate a swelling pressure that inflates the gel. The collagen fibrils are composed of collagen type II, V, XI and IX. They are organised into small bundles, and interconnections between these bundles allow the formation of an extended network that maintains the gel state.

During aging, the vitreous progressively liquefies and pockets of liquid form in the gel. In the adult eye, 20% of vitreous is liquid, then after the age of 40 years there is increasing liquefaction so that by 80 to 90 years of age more than half of vitreous is liquid. The vitreous liquefaction, in conjunction with age-related weakening of postbasal vitreo-retinal adhesion, then results in the posterior vitreous...

Abstract: Purpose: This survey is the first one in world to evaluate the pharmacologic effects of the pineapples for floaters. Indifferent designs, we followed the results of patients who took various doses of pineapples each day for 3 months. Methods: The studies and sources of crude pineapples were all scheduled between 2016 March with June in southern Taiwan including City Tainan, Kaohsiung and Pintung. The delicious and well benefit pineapples were famous and supplied by the local farmers selling to the world by trades since 1900. In this studies, 388 participants were arranged to undergo series of ocular examinations during the series of experiments. In experiment 1, 190 subjects were classified into group 1 (one floater) and group 2 (multiple floaters) and they all took 2 pieces of pineapples after lunch every day for 3 months. In experiment 2, the 198 eyes with various vitreous floaters were classified into 3 groups by chance according to the extent of pineapple intake including low pineapple group (LPA), middle pineapple group (MPA) and high pineapple group (HPA). In all experiments, our staffs cut into one piece of pineapple with 100 gram grossly. Regular intake of pineapples is good for health-promotion and even cancer-prevention; however, preventing from the higher blood glucose and caloric restriction daily, the reasonable amount of pineapple is 2-3 pieces within healthy ones. In our experiment 2, the amounts of oral pineapples in LPA, MPA, and HMP were 1, 2, and 3 pieces after lunch each day, respectively. Results: In experiment 1, 100% subjects of one floater (120 eyes) subsides to only 29.2% (35/120) after 3-month-therapy. Besides, 70 participants with multiple floaters decreased to 19 cases (27.1%; 19/70) three months later. In a world, the extract pineapple may enhance floaters disappearance. In experiment 2, groups 1-3, (each group = 66 eyes) were choose randomly to different supplements including the LAP, MAP and HAP intake also for 3 months. It is surprised that from pineapple may increase the rate of disappearance of vitreous opacity. The percentage of decrease of floaters by taking the pineapples was 45.5%, 37.8% and 30.2% and 1, 2, 3 pieces, respectively. It also showed that pineapples for treating the patients with floaters with dose-dependent manner. In addition, the protocols for therapy of the floaters were no special side effects. Furthermore, the mechanisms of dissolving floaters may be to cut and clear the vitreous fibrils and to scavenge the free radicals which could result in hyaluronic acid degradation and vitreous floater formation. Conclusion: We found that taking pineapples should diminish the persistence of floaters, posterior vitreous detachment and even extracellular matrices which could impact the disturbance of vision and even associated complications. [Chi-Ting Horng, Fu-An Chen, Daih-Huang Kuo, Li-Chai Chen, Shou-Shan Yeh, Shuan-Yu Huang, and Po-Chuen Shieh. Pharmacologic vitreolysis of vitreous floaters by 3-month pineapple supplement in Taiwan: a pilot study. J Am Sci 2019;15(4):17-30]. ISSN 1545-1003 (print); ISSN 2375-7264 (online). http://www.jofamericanscience.org, 3. doi:10.7537/marsjas150419.03.

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detachment (PVD). In clinics, the symptom of PVD is the most common cause of acute-onset floaters. A recent paper by van Overdam and his co-workers suggested that patients with isolated PVD, vitreous floaters, vitreous hemorrhages or retinal hemorrhages at initial presentation need to be rescheduled for a follow up visit (2). All peoples were instructed to return if the number of floaters increases. However, the majority of PVD is benign and physiological change. When the human is older than 40 years old, PVD gradually impact the visual axis. Moreover, the prevalence of PVD is up to 24% among aged 50–59 years, increasing to 87% among peoples older than 80 years. In PVD, the vitreous shrinks and detaches from the retina leading to floaters. In 14% of cases, tractional forces from the vitreous jelly over the retina sometimes caused the retinal tears. However, left untreated, the tears which result in break may allow fluid to enter the sub-retinal space and could progress to retinal detachment (RD) and even blindness. Therefore, early to wipe out vitreous floaters is very important for eyesight preservation (3).

Physiologically, the vitreous is a complex biochemical and structural procedure. It is completely attached to the retina. Floaters usually begin happen as few small spots, curtains and clouds becoming much dense upon time. In most cases, vitreous opacities occur as a result of degenerative changes. The vitreous liquefaction should provoke condensation of vitreous collagen fibers and PVD which showed floaters. More dramatic condition is to induce the existence of floaters. In human, most ocular floaters are small flecks of a protein called collagen in the back of your eye. As you age, the protein fibers that make up the vitreous shrink down to little shreds that clump together. The shadows they cast on your retina are floaters. If you further see a flash, it’s because the vitreous has pulled away from the retina. Besides, posterior uveitis or bleeding in the eye are other reasons of ocular floaters which belongs to the serious condition of eyes (4). At times, the symptoms of floaters may occur when these patients suffering from high fever, head injuries or influenza at times and the troublesome problem should recover spontaneously after two weeks. However, after aged 40, the vitreous gel should begin to liquefy involving nearly 50% by age 80, a process called synchysis. When the lysis formed, posterior scaffold should detach from the retina with the intervening space (5). General speaking, the patients with monocular floaters often reflect some underlying ocular diseases. For example, the major causes of monocular floaters included PVD, vitreo-macular traction (VMT) and vitreous hemorrhage. Additionally, although less likely, monocular causes of floaters also include endophthalmitis, uveitis, vitreous lymphoma, and retinal degenerations. According to past studies, the relationship between ocular floaters and PVD was close. The presence of complete PVD was highly associated with symptomatic vitreous floaters. Therefore, it is very important to realize the pathophysiology of the vitreo-retinal interface for knowing how to well separate and remove the vitreous from the retina safely and prevent from associated complications such as retinal detachment (RD) and full-thickness macular holes (FTMHs).

The probability of PVD being complicated by a retinal break or rhegmatogenous RD (RDD) has been influenced by the presence of high myopia, cataract surgery, peripheral retinal degeneration, trauma, previous RDD and a positive family history.

There are several high risks of the developing floaters such as age > 50 years old, nearsightedness, eye trauma, complications from cataract surgery, eye inflammation and diabetic retinopathy. Ocular floater sometimes may accompanied with flashes which means the possibility of retinal tear, incomplete detachment or an adhesion of the vitreous body on the internal limiting membrane (ILM), VMA, vitreo-macular traction (VMT) with separation between the vitreous and the macula, FTMHs and resulting in retinal detachment. In addition, it sometimes could increase the macular thickness and decrease best-correction visual acuity. Therefore, this is very important to differentiate from the physiological condition for avoiding emergent floaters (5).

In this study, we focused on the age-related eye changes of the vitreous and the vitreous liquefaction and afterwards, separation from the internal limiting membrane (ILM) of retina will happen and the process is mediated by the aggregation of collagen fibrils and degeneration of extracellular matrix component at the vitreo-retinal interface.

In optometry, floaters are the opacities in the vitreous body which case shadows onto the retina. The Patients see them as small moving spots or specs in the visual field. Floaters move as the eye moves, but do not follow eye movements precisely. When attempted to look directly at them, the floater seem to move away, while blinking does not get rid of them. They are mostly seen when looking at something bright like white paper, plain white or blue sky. The floaters may appear as various shapes of lines, circle, dots, cobwebs, clouds, and flies. In our study, one of any shapes of retinal images was all considered as the same one, and at last, we would count the numbers of total floaters as the prognostic factors about the effectiveness of pineapple treatment. Once exact diagnosed, the patients complaining of floaters are usually managed conservatively with reassurance the suggestion that over the time they will adapt to the
Traditionally there are two main management options, pars plana vitrectomy (PPV) or observation in the past. The latter for stable mild disease that does justify the risks of surgery or in some eye with VMT will resolve spontaneously (6). Even if the spontaneous resolution of VMT and fibril strands could happen, more aggressive therapies is indicated for the possibility of vision loss. Observation may have disadvantages, with a nature history study reporting that only 11% of patient’s eyes showed spontaneous dissociation over a mean follow-up of 5-years, whereas 64% of eyes lost at least 2 Snellen lines over this timeframe. In addition, VMT can also progress to FTMH during observation. However, the patients who experience persistent or severe symptomology may undergo PPV. Equally, PPV for VMT may have various disadvantages, with only one-third of eyes gaining 2 or more Snellen lines. Furthermore, PPV is associated with postoperative patients’ burden and the serious complications such as endophthalmitis and increased intraocular pressure (IOP) (7). Furthermore, the postoperative retinal detachment occurs in 2.4%, and 92% of phakic eyes are likely to develop the cataract within 3 years of PPV (8). Some new techniques, for instance, Nd:YAG laser vitreolysis, pharmacologic vitreolysis and even 25-gaue vitrectomy developed (9). For example, Nd: YAG laser vitreolysis is commonly used in treating the vitreous opacities located near the posterior retina. Some reports claimed that the success rates by existing publishing are highly variable, ranging from 0% to 100% (10). However, the shock from the Nd:YAG laser will use to break the vitreous floaters may sometime damage the human retina and impact the visual loss (11).

Recently, a new method of enzymatic vitreolysis with intravitreal ocriplasmin (Jetrea; Thrombogenics USA, Alcon) which is a recombinant and truncated form of the human serine protease plasmin. In recent time, ocriplasmin (microplasmin) is a potential alternative treatment for patients with symptomatic VMT and macular hole that could also remove fibril strands and vitreous opacity by pars plana vitrectomy (12). The ocriplasmin induced the smaller fragment of the plasminic enzyme and was approved as the first non-surgical treatment for patients with VMT by the Food and Drug Administration (FDA, USA) in 2012 (13,14). A total of 26.5% of subjects receiving a single intravitreal ocriplasmin (125μm) achieved the primary end point of pharmacologic VMA resolution at day 28 compared with 10.1% of placebo (15). The medical effect of ocriplasmin is enzymatically to degrade the protein scaffold in the vitreo-retinal interface and cleave collagen, fibronectin, and laminin which are the major components of the vitreous strands and floaters. It may lead to various degrees of vitreous liquefaction and loosening of vitreoretinal attachment which would decrease the development of epi-retinal membrane, VMT, and RRD (16). The same idea as the effectiveness of ocriplasmin about treating the vitreous body associated overgrowth tissues (17). The similar method may be used to cut the extracellular matrixes and clear the useless vitreous fibrils.

How to use the concepts of proteinases, for example, trypsin, chymotrypsin, papain and some hydrolytic enzymes to dissolve the vitreous strands and floaters is a advanced option in the future. Bromelain is extracted from stems and fruits of the pineapple and it contains various proteolytic enzymes such as anti-inflammatory, analgesics, anti-thrombotic and antifibrinolytic properties (18). In clinic, it is now prescribed as the treatment of several diseases, for example, osteoarthritis, dental pain and post-operative swelling (19). During our experiences, pineapple may also be a good source of fruit which would supply hydrolytic enzymes to interact the vitreous contents and treat the patients with vitreous opacities. Pineapple (Ananas comosus) is a delicious crown shaped fruit that grows on the tropical plant of the same name. It is a good source of a number of essential nutrients like vitamins, minerals, phytonutrients, antioxidants etc. and the presence of these nutrients make it a wonderful fruit for our health, skin and hair. Pineapple is the common name of Ananas comosus and the leading edible members of the family Bromeliaceae, grow in the tropical and subtropical areas including Taiwan, southern China, Philippines, Thailand, Indonesia, Malaysia, Kenya, and India. It has been used as a medical plant in several native culture and these medical qualities of pineapple. Its main component is a sulfhydryl protease, with traces of acid phosphate, peroxidase inhibitors and several low molecule weight compounds.

The stems and fruits from the pineapple always contains protease, particular bromelain, a non-proteolytic component which is mainly responsible for complete debridement and dissolve the over-growth connective tissues including several proteins and mucopolysaccharide substrates from human body (20). When we analyzed the proliferative phase in human, this event fosters the production of proangiogenic factors. Vascular endothelial growth factor (VEGF), fibroblast growth factor 2 (FGF-2), and PDGF2 initially released by platelets and then by resident cells. Besides, endothelial progenitor cells (EPCs) also plays an important role which is mediated by MMP and other
factors for matrix remodeling and even scar formation (18). Moreover, the protease including Matrix Metalloproteinases (MMPs) would be found in the vitreous level in the proliferative diabetic retinopathy which could degrade the ECM and growth factors. Therefore, we suggested that the autolytic, biological, and enzymatic which would be used in the biological activities bromelain in removing vitreous constitutes and its floaters (21).

In this study, we will evaluate the effectiveness of pineapple plant to treat the patients with ocular floaters and some VTM s for the restoration of visual axis and even recovery from the baseline.

Methods and Materials
This institutional review board (IRB) approved retrospective study included 388 consecutive eyes of 388 patients complained about floaters on the southern Taiwan. This study followed the tents of the Declaration of Helsinki. Moreover, patients were included if they were at least 18 years of age and did not suffered from the ocular floaters after trauma or major disorders within 6 months. The reason is that some medical reports demonstrated that the quick liquefaction occurred, and the inner contents should result in change after trauma or other disorders. Interestingly, in experiment 1, when these ocular images of high conscious subjects mentioned at least 1 image interpreters, the diagnosis of vitreous opacities, PVD and some symptomatic SMV subjects were confirmed by indirect ophthalmoscopy, B-San (ultra-sonography) and spectral domain optical coherence tomography (SD-OCT) of all participants (22). Ultrasonography is routine used to diagnosis PVD and vitreous floaters, because of their characters of dense collage matrix. Besides, OCTs allow detailed imaging of the transverse and coronal aspects of the vitreoretinal interface. It may also easily and clearly detect the vitreous floaters. Therefore, a dilated examination of the ocular fundus is mandatory. Therefore, only patients with stable and solid vitreous opacity and PVD were enrolled in our experiment. However, the floaters form the blood clots or unexpected incomplete PVD were all excluded in our experiments (23). Besides, all the systemic diseases; hypertension, DM, hyperglycemia and connective tissue disorders may impact the normal physiological PVD. Moreover, age, and lens status showed significantly positive impact on floaters. Moreover, the vitreous hemorrhage in proliferative retinopathies including diabetic retinopathy, sickle cells, venous occlusion, Edes disease, intraocular inflammation, trauma surgery, and asterosis hylosis as well as myopia (high myopia > 8D). The above were excluded from our study excluded from our study because of the complicated vitreous-retinal path-physiology.

Any one shape of shadow of floater was considered as one image. In addition, the numbers of the ocular floater was greater than one image and we concluded to the group of patients with multiple floaters. The peoples with patients were excluded if the signs from the examinations were not apparent when they subjectively suffered. The persistence of vitreous floaters from the patients’ description and the object findings (focal echodensities) from the B-scan ultrasonography and ophthalmoscopy were all confirmed together. Indeed, the ultrasonography provides rea-time imaging of internal and peripheral vitreous structure. Besides, it expands the evaluation of the patients with floaters (24). When subject complaints and the exact diagnosis was consistent, the subject should be enrolled in the study. All 288 participants were divided by the numbers of ocular floaters to one or multiple (>1). Therefore, the patients were all asked to take various pieces of the pineapples and the time of study endpoint time was three months. After they began to eat the pieces of pineapples which were prepared by our medical staffs, the patients returned for series of examinations of check-up every month. All the crude pineapples were from southern Taiwan including Pingtung, Kaohsiung and Tainan and cut open to several pieces (Fig. 1). After weighting, every piece of the pineapple was mean 100 gram. All 388 patients will take the pieces of pineapple according to various designs. The 190 and 199 subjects were enrolled in experiment 1 and 2 randomly. At first (experiment 1), 190 patients were separated to 2 subgroups: one floater and multiple floaters (>1) in experiment 1. Secondly (experiment 2), 199 subjects with one or multiple floaters would be divided into 3 subgroups randomly and they received various (low, middle, high) treatment in the experiment 2. When the numbers decreased, the positive findings were confirmed as successful therapy. Afterwards, we compared the results of the pineapples to the treating the ocular floaters in the experiment 1 & 2 before and after 3 months.

There was sdualed between 2016 March with June in 2016 for heidig the “bright: survey about the concet for treating ocular flater which is an incurable disease in the past decaded. All 388 participants were arranged to undergo underwent series of ocular examinations. The whole study was done omletely whole-3-month and we compared with the outcomecomes after 3-month supplement. In fact, the bromelain is obtained from the stem or fruit of the pineapple. It is sold in the form of a powder, cream, tablet, and capsule. In our study, we directly cut the whole pineapple into several pieces horizontally.
which each piece pineapple may contain stems and fruits. In experiment 1, the 190 participates were separated to one floater (group 1) and multiple floaters (group 2). Hence, all the 190 subjects were asked to eat 2 pieces of pineapples prepared by our staffs every day. In the experiment 2, 198 patients with 198 eyes would be considered to 3 subgroups: low pineapple group (LPA) · middle pineapple group (MPA) and high pineapple group (HPA) for various pieces of the designed supplement. Taking too many pineapples is harmful to DM patients which may elevate the glucose level in the blood and the maximal amount of the pineapple in our experiment is to eat 3 piece (about 300 g) each day which is safe. Therefore, we designed for 2 pieces of pineapples (around 200 mg/day) for the management strategies for everybody in experiment 1. Besides, in experiment 2, all 199 patients were divided to 3 subgroups and their received various doses treatment. The low-, middle-, and high-dose pineapples (LDP, MDP, HDP; 1, 2, 3 pieces, respectively) were given. Afterwards, we compared the outcomes of the pineapples to the treating the ocular floaters after 3 -month treatment. In experiment 1 and 2, the participants all took the pineapple after the launch. Besides, all subjects were arranged to return to receive series of examinations and follow the ocular condition every month.

All patient charts were reviewed for age, sex, lens status, chief complaint, the numbers of ocular floaters, any discomfort and side effects from the patients. Besides, all data were measured and the statistically differences were measured for the effect of pineapples with use of SAS 9.0 (SAS Inst., Cary, NC, USA). The P value < 0.05 was considered statistically significant.

**Results**

In the whole study, no retinal damage or ocular inflammation were observed. Besides, the intraocular pressure and blood sugar of all participants was normal. All the vision of the participant remained stable and the angle of chamber, lens status corneal and zonular fibers all showed normal by mean of slit lamp (SL-D7; NIDEK) and anterior segment OCT (Heidelberg OCT) (25).

Furthermore, no participants suffered for any discomfort and side effects from the pineapple supplement. The definition of the case “succeed” is that the floaters and retinal shadows were no longer visible by the indirect ophthalmoscopy and even SD-OCT detection. Beside, some of the participants would tell us that they could see the scene beautiful without black image blacking after 3 months.

In experiment 1 (2 pieces /day for every one), the percentage of 120 patients with one floater successfully disappeared to only 35 subjects (29.2%; 35 /120) (P < 0.05). Besides, 70 patients with multiple floaters decreased to only 19 patients (27.2%; 19 /70) with regular supplement of pineapples for 3 months (P < 0.05) (Table 1).

In experiment 2, the final results of various floaters in 3 groups with LPA, MPA, and HPA treatment were compared after they took different doses of the pineapple for 3 months. Firstly, we found that 66 patients with LPA treatment taking one piece of pineapple every day in subgroup 1 decreased to 33 subjects (45.5%; 30/66) after 3 months (P < 0.05). Secondly, 66 participants with MPA treatment taking two pieces of pineapple every day in subgroup 2 significantly changed to 22 subjects complaining about decreased shadow of retinal image (33.3%; 25/66) after the whole 3-month perloid therapy (P < 0.05). In subgroup 3, 66 patients were asked to take 3 pieces of pineapples each day. Three months later, the patients with lower floaters dramatically changed to 17 patients (25.8%; 17 /66). During series of examinations, we found the vitreous opacity had absorbed without further blocking the visual axis (Table 2). Furthermore, it is reported that the greater amounts of pineapples intake, the lesser patients remained the vitreous opacities and floaters. According to the maximal doses of pineapple supplement, the more effectiveness in treating floaters and enhancing the vitreous opacity showed lysis. In summary, treating the patients with ocular floaters by pineapple supplements revealed the dose-dependent manner. It is interesting to find that the patients with floaters during a 3-month-perloid therapy were 45.5%, 33.3% and 25.8% and 1, 2, 3 pieces of pineapple, respectively. We concluded that pineapples intake may decrease the aggregation of collagens fibrils forming fibers and the rates of symptomatic floaters. Furthermore, we suggested that bromelain is advantageous over the frim PVD easily separated.
from the vitreo-retinal interface. Therefore, pineapple supplement is good for the patients with various floaters.

Table 1: The change of various floaters before and after eating over a period of 3 months

<table>
<thead>
<tr>
<th>Ocular floater numbers</th>
<th>Before</th>
<th>1st month</th>
<th>2nd month</th>
<th>3rd month</th>
</tr>
</thead>
<tbody>
<tr>
<td>One</td>
<td>120</td>
<td>119</td>
<td>88</td>
<td>35* (29.2%)</td>
</tr>
<tr>
<td>Multiple</td>
<td>70</td>
<td>68</td>
<td>52</td>
<td>19* (27.1%)</td>
</tr>
</tbody>
</table>

N= 190 eyes

1. Multiple floaters means that the patient with at least 2 floaters.
2. After treatment, the patients with multiple floaters may complete or incomplete disappear. Therefore, the multiple floaters would change into 1 or 0 floaters.
3. We compared with the results at the basal time and 3 months by ANOVA. If p value is less than 0.05, it showed significantly different.

Table 2: The change of ocular floaters before and after taking pineapples over a period of 3 months

<table>
<thead>
<tr>
<th>Numbers of pineapple</th>
<th>Before</th>
<th>1st month</th>
<th>2nd month</th>
<th>3rd month</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 piece</td>
<td>66</td>
<td>66</td>
<td>54</td>
<td>30* (45.5%)</td>
</tr>
<tr>
<td>2 pieces</td>
<td>66</td>
<td>66</td>
<td>56</td>
<td>22* (33.3%)</td>
</tr>
<tr>
<td>3 pieces</td>
<td>66</td>
<td>60</td>
<td>58</td>
<td>17* (25.8%)</td>
</tr>
</tbody>
</table>

1. Group 1 (N= 66 eyes): the patients took 1 piece of the pineapples
2. Group 2 (N= 66 eyes): the patients took 2 pieces of the pineapples
3. Group 3 (N= 66 eye): the patients took 3 piece of the pineapples

*2. We compared with the results at the basal time and 3 months by ANOVA. If the p value is less 0.05, it showed significantly different.

Discussion

Vitreous is a dilute meshwork of collagen fibrils interspersed with extensive arrays of hyaluronan molecules. Besides, hyaluronan is the major macromolecules of vitreous which is a, unbranched polymer of repeated disaccharides linked by glycosidic bonds in Physiology. Moreover, hyaluronin is also covalently to a protein core; the ensemble is called proteoglycan. From further analysis, vitreous contains collagen type II, a hybrid of type V/XI, and IX collagen in a molar ratio of 75: 10, 15, respectively. The Vitreous collagens are organized into fibrils, with type V/XI residing in the core, type II collagen surrounding the core, and the IX collagen on the surface of the fibrils.

In anatomy, vitreous consists of hepatocytes, collagens (type I, IX, V/XI and VI collegens), GAGs, PGs, and other extracellular matrix molecules (fibrillin, Optcin, VIT-1). The collagen molecules are coiled by three α polypeptide chains coiled into left-hand helix. The three chains are then warps around each other to a right amino acid is a glycine-residual that creates Glycine-X-Yn amino acid repeat. The X-and Y-repeats can be any amino acid, but often X is alanine or proline, and the Y is at times hydroxyproline. Besides collagens, are also rich in lysine. All collagens have non-triple-helical region bonds and stabilizes the structure of the collagen triple. Hydroxyproline forms hydrogens bonds and stabilized. The lysine and hydroxylysine residues are necessary for the flotation of intramoculecular cross-link, which stabilize the collagens fibrils. Hydroxylysines also provides potential sites for postslational glycosylasines. To date, nearly 30 different types of collagens molecules for more than 40 genes have been characterized. Interestingly, vitreous collagens resemble collagens fibrils.

The onset of floaters is often secondary to PVD and the possible complications. When the patients complained about floaters, they should be referred to special ophalmologists for detailed examination to exclude the more peripheral region of retinal tear or detachment. Moreover, the physicians should identify the possible “vitreous floaters” as urgent approach. According to previous studies, acute onset of floaters and even PVD would develop into the retinal break within six weeks. However, early diagnosis and possible treatment for the floaters and PVD becomes very serious.

The nature and composition of the vitreous humour changes over the course of life. In adolescence, the vitreous cortex becomes more dense and vitreous tracts develop; and in adulthood, the tracts become better defined and sinuous. Central vitreous liquefies, fibrillar degeneration occurs, and the tracts break up. The coarse strands develop with ageing. The gel decreases with age, and the liquid volume increases. Cortex may disappear at sites, leading to liquid vitreous extruding into the potential space between vitreous cortex and retina. Therefore, vitreous floaters may be the symptoms or signs from peoples which is leading to the ghosts of blindness by
the side (26). A follow-up visit for patients with an isolated PVD or floaters can be justified to detect the small percentage of asymptomatic retinal breaks.

Vitreous opacities may affect patients at any age whereby you experience eye floaters. Most of the floaters are small spots that drift through the field of human vision. Moreover, they may stand out when you look at something bright, like white paper or a blue sky. Visual floaters are visual phenomena caused by degenerative changes of the vitreous gel. Over time, the vitreous collagen type IX decreases, resulting in the surface exposure of “sticky” type II collagen. Hence, these result in the vitreous collagen fibrils to aggregate and liquefy, and accompanied vitreous shrinkage and clumping make tiny shadows on the retina (27). The PVD entailed the collapse of the vitreous body and anterior displacement of the posterior vitreous cortex and is the most common cause of floater. The symptoms might annoy some peoples and shouldn’t interfere with the eyesight. However, the floaters sometimes may impair the ability to read, use the computer and smartphone, and drive. The impact is more challenging for some high detail visual requirements, particularly in dynamic setting, for instance performing music from sheet music. It even appears in the peripheral vision, giving the sensation of peoples approaching from behind or from the side. Efforts to temporarily alleviate visual interference include eye blinking, rubbing eyes, closing one eye or moving the head. These maneuvers only give short windows of visual clarity. Vitreous floater symptoms usually subside with passage of time; however, some patients with floaters may suffer from persisting discomfort, psychological distress and seek medical care. Hence, the constant struggle to achieve adequate visual transparency for some peoples comes to impact their emotional and physical resilience as well (28). Interference of the floaters with the visual axis would result in patients’ discomfort. Besides, the contrast sensitivity may decrease to 67% starlight increase in eyes which would induce the unhappy mood (29). Recently studies indicated that vitreous floaters can have a significant negative impact on visual function and in turn the quality of life (30). Although in most patients the floaters are minimal, they can cause various significant impairment in vision-related quality of life in a small population of patients. Now, a new definition of floaters as “symptomatic vitreous opacities (SVO)” was further made. Ivanosva et al. summarise that the SVO also could lead to intermittent blurred vision, glare and even haze attributable to migration of vitreous opacities into the visual axis. This event interferes with many important activities of daily life such as reading, driving, and performing near work (31). Wagle and his co-workers reported that these patients with floaters and PVD were willing to take an 11% risk of death and a 7% of blindness just to get rid of the bothersome floaters due to impairment of driving (30). Therefore, how to decrease the numbers of vitreous floaters becomes the importance issue. Besides, they also raise the demand for healthcare for the ophthalmic professionals and extend the range of their service provision (32).

The vitreous liquefaction which destabilizes collagen fibrils at age 4 years and 12.5% of the vitreous is liquefied at age of 18. The most common etiologic cause of floaters is age-related and myopia-induced liquefaction of the vitreous gel. It is to find that liquefaction induces collagen into visible fibrils and leads to collapse of the vitreous body. According to further research, the most macromolecules in vitreous are collagen II and collagen IX, glycosaminoglycans (GAGs) which like hyaluronic acids (hyaluronan; HA), proteoglycan (PGs) and non-collagenous glyco-proteins. Because the characters of water may bind to HA, the ageing process would lead to two structural changes: (1). depolymerization of HA which cause release of water structural changes (2). loss of collagens IX which provokes aggregation of collagens II fibrils and further leads to formation of fluid filled with lacunae. Therefore, collagen filaments aggregation and condensation resulted in formation of larger fibrils, which would float in lacunae of liquefied vitreous giving the patients the perception of floaters. The speed at which these vitreous changes happen depend on the people’s age, environmental factors, exposure to sunlight, oxidative stress, and HA-collagen interaction. As for age, patients > 70 years old, we could find that at least 50 % of the vitreous is liquefied. In summary, the floaters did not impact the human visual acuity; and the numbers are sometime increase with age.

In young ages, the vitreous is a clear gel that fills the vitreous cavity, occupying approximately 80 percent of the volume of the globe, so called “myopic vitreopathy”. In nature, the vitreous consists mostly of water (99%) as well as hyaluronic acid and a meshwork of fine collagen fibrils. An important area is the vitreous base, a 3- to 4-mm-wide circumferential zone of vitreous that straddles the ora serrata. In the vitreous base, the collagen fibers are firmly attached to the underlying peripheral retina posterior to the ora serrata and to the pars plana epithelium anteriorly. Other areas of firm vitreous attachment are at the edges of retinal scars, in areas of lattice and other vitreoretinal degenerations, at the optic disc, and along the major vascular arcades. The prevalence of PVD increases with age, with axial
length, and following cataract surgery and trauma. Vitreous floaters would be a part of the PVD in clinic. According to other articles, it is demonstrated that myopic peoples should experience floaters and PVD approximately 10 years earlier than those with emmetropia or hyperopia. Besides, human lens removal allows hyaluronic acid to diffuse more easily out of vitreous into the anterior chamber and subsequently out of the eye. Then, the unsupported collagen fibers then collapse together. Indeed, the posterior capsule may induce an effective barrier to hyaluronic acid, and the procedure of posterior capsulotomy may enhance floaters and possible PVD easily. This event occurs as a result of liquefaction. With increasing age, an opening ultimately develops in the posterior vitreous through which the central liquefied vitreous passes suddenly into the retro-vitreal space, rapidly dissecting a plane and separating the posterior hyaloid from the retina. Furthermore, floaters and PVD is involved as inciting event in most cases of RRD (33). Typical symptoms of PVD are floaters which are described as cobwebs, spots or hair in the field of vision, and they are caused by vitreous opacities, for instance, the epipapillary glial tissues torn from the optic disc, condensations of vitreous collagen, and/or blood. However, acute symptomatic retinal breaks resulting from severe PVD have a high risk of RD with visual loss. Moreover, incomplete PVD may also induce the formation of VTM. If it left untreated, partial VTM may improve through spontaneous resolution, and however, some patients unfortunately developed into deterioration in their vision. Therefore, removal of vitreous floater becomes the mainstay treatment in unexpected development of ocular diseases.

Current treatment options for vitreous opacity, PVD, and symptomatic VMT in patients included the observation, pneumatic vitreolysis, Nd: YAG laser vitreolysis, pars plana vitrectomy and nearly developing pharmacologic vitreolysis. At first, close observation by the experienced ophthalmologists at regular time indicated when the victims if relative young or too old to clean by for the old peoples with limited vision. Indeed only close follow-up is certainly a reasonable initial approach, as the progress of VMT is known to spontaneously release in some patients. Therefore, early to preserve the human body and even ophthalmic acuity is very important. The VMA always developed when the traction forces exerted on the area of adherence which are sufficient to produce anatomical distortion of the macula, resulting in severe VMT and even FTMHs formation. The symptoms and signs of patients with VTM and FTMHs included ocular floaters such as meta-morphopsia, visual acuity changes, lower the contrast sensitivity and central visual fields defects. As the timing of operation, In Japan, most of the vitreo-surgeons favored that the time of emergent operation until observation when the patients’ best-corrected visual acuity dropped to 6/30 (12).

Patients with vitreous floaters and mild PVD could receive closely follow-up. Although almost all patients accept the conservative management option, there is a small subset of patients who may desire a more aggressive treatment intervention for resolution of their visual symptoms (21). However, they does not spontaneously release, aggressive treatment including surgery should be taken into consideration. For example, vitrectomy is indicated for the common choice. Till today, various methods were arranged to treat the vitreous floaters, complete or incomplete PVD, and symptomatic VMT. Vitreous floaters are a common complaint in the ophthalmic care setting. However, most of the condition is benign, ophthalmic care practitioners have little to offer regarding treatment options. The majority of cases encountered are managed with patient education and reassurance. Now, there are several therapies in solving the above vitreous problems including vitrectomy, pneumatic vitreolysis, Nd: YAG laser vitreolysis, and pharmacologic vitreolysis (34).

Pars plana vitrectomy is an effective treatment to surgical removal of the vitreous opacities, incomplete fibril strands, firm VMA, symptomatic VMT and even FTMHs until 1991. Some surgeon even made use of the gas tamponade (SF6 or C3F8) for as long as possible in an attempt to enhance closure rates. Kelly and Wendel postulated that vitrectomy would removal traction around the hole and this, combined with gas tamponade, would result in the ring of perifoveal detachment flattening with some (58%) improvement their vision (35). There is a relationship between these two choices- gas choice and postsurgical requirement--- that related to the amount of time of time that gas still bridges the severe VMT or holes. The combined gas (air-fluid exchange) could cross the defect of a macular hole without face-down positioning down in an upright position if the gas fill exceeds 50%, an long-acting tamponade will maintain >50% gas till for a long time than air or short-acting gases. Unfortunately, vitrectomy could also carry significant surgical risks, including cataract, glaucoma and RD which may limit the broad indication of vitrectomy for floaters (36).

As for the method of pneumatic vitreolysis (PVL), the small quantity of expansible gas was injection into the vitreous cavity for achieving focal VMT release for eyes with symptomatic VMT. The method of pneumatic vitreolysis is the intravitreal injection of a small quantity of expansible gas for the purpose of achieving focal VMT release for eyes with
floaters, VMT, or inducing VMT release and closure of macular defect since 1993. The success rates of VMT release have ranged from 60% to 100% and the rates of closure of small macular holes have ranged from 50% to 80% following PVL which is a promising, low-cost therapeutic option, with the potential for managing symptomatic VMT and vitreous floaters on a global scale. The intravitreal special gas (i.e.: CF₆) bubble creates an intragenic PVD that relieves VMT in some patients. However, the success rates of VMT release ranged broadly. Besides, the danger of intravitreal injection including intragenic cataract, glaucoma, endophthalmitis, retinal breaks, and the development of RD (37).

Nd: YAG laser vitreolysis is attractive because it is relative simple and effective for treating the mid-, posterior floaters and even Weiss ring floater (38). The mechanism of laser vitreolysis would be used to the lysis of fibers and rhesis of aggregates, followed by displacement out of the visual axis which could be offered to treat symptomatic vitreous floaters. Recently, this method has been widely used to collagenous vitreous strands, tranvitreal sheets or bands, and mostly to break the vitreous opacities. This is generally performed by focusing the laser onto the vitreous opacities visible at the slit-lamp. Typically, only opacities relatively far from the retina are treated, thus these represent a subset of floaters that might be appropriate to treat with Nd:YAG laser. Unlikely vitrectomy, the laser is closed eye obviating the risk of endophthalmitis, rapid progression of cataracts, elevated intraocular pressure leading to glaucoma, posterior capsule defects, retinal tear or hemorrhage and even severe RD. However, this non-aggressive alternative method is more dedicated and safe than vitrectomy. Therefore, amorphous floaters in the midto posterior vitreous are clinically significant and difficult to visualize and treat by Nd:YAG laser.

Medical therapeutic evolve from surgery to pharmacotherapy and then to prevention as a result of increased knowledge about the origin and pathophysiology of diseases. The treatment of vitreo-retinal diseases is currently undergoing the first stage of this paradigm shift with development of pharmacologic vitreolysis. Hence, the concepts of proteolytic and collagenotic enzymes to attempt to remove and dissolve of burn or traumatic eschar and proliferative tissues for years. It is interesting to find that the stem of the pineapple plants also contains a number of protease (particular bromelain) and non-proteolytic component enzymes (for the complete debridement of burn). Current option showed that the decreased vitreous cells and proliferative tissues. Therefore, intravitreal injection with Ocriplasmin is a potential alternative therapy for floaters, and VMT. The enzymatic activity of ocriplasmin at the vitreoretinal interface facilitates release of VMT in some patients and must simultaneously liquefy the gel liquid and weakening the VMA. A randomized, controlled trial (called MIVI-TRUST) examined the use of ocriplasmin for pharmacologic treatment of VMT in 652 eyes. Therefore, Stalmans et al reported that the success of traction release was achieved in 26.5% at day 28, significantly compared with only 10.1% in the control group. The vitreous floaters and VMT is the pathologic consequence of vitreous attachment with structure disturbance of retina which would be dissolved by ocriplasmin successfully (22). Grandorf et al. reported that dose- and time-dependent cleavage by ocriplasmin between posterior vitreous cortex and the ILM in both human cadaver and feline eyes (38). Recently, ocriplasmin is even considered as the cost-effective in patients without epiretinal membrane or full thickness macular hole which is useless to utilize vitreolysis and absorbing the extracellular matrix and proliferative tissues such as vitreous floaters (so called vitreous balls).

The reason for sudden onsets in patients 50 years or older has been related to PVD in 95% cases. Furthermore, in the pathogenesis of PVD, after vitreous liquid liquefaction, the second most important event is the age-related weakening of the adhesions between posterior hyaloid membrane and the internal limiting membrane, which leads to separation of these two structure, shrinking and collapse of the vitreous body (39). In patients with high myopia, vitreous liquefaction, floater liquefaction occurred floaters related PVD occur much earlier compared to the same age patients, with emmetropia or hyperopia (40). Early vitreous liquefaction and PVD has described ion conditions following trauma, phakia, intraocular inflammation, vitreous hemorrhage and retinal venous diseases (41). During ageing, the vitreous degenerates by times, collapses and detaches from the retina which may induce the complete or incomplete PVD. The most common complications of age-related total PVD, are retinal tear, vitreous, retinal, and optic-disc hemorrhage as well as RDD.

Because the association between vitreous floaters and PVD is very close, it is very important to realize the epidemiology. In patients with acute onset of floaters as a consequence of PVD, the incidence of the retinal tear 14.5% and that of vitreous and/or retinal hemorrhage was 22.7% (42). Besides, visual impairment was found to be a predictor for retinal pathology, which is in accordance with previous studies where 67% of patients with decreased visual acuity had retinal tears or detachments whereas 19% of patients with floaters or flashes alone had these conditions (22). A previous study showed floaters
in 42%, flashes in 18%, and both floaters and flashes in 20% of PVD and secondary retinal pathology. The incidence of retinal rupture increased from 4%–5% with only floaters to 10%–11% with flashes with/without floaters. However, floaters alone should not be discarded as unimportant; It is found that 26.7% of the retinal tears or RD occurred with floaters alone. It has been shown that PVD usually occurs in the other eye within 6 months to 2 years after the first eye. It is likely that PVD is a parallel process in both eyes and thus the patient should be informed of possible pathologies not only in the eye with the present pathology but also in the other eye as well. Hence, the presence of a retinal tear should promote special attention to the retinal status of such a patient in the future. Therefore, we had better approach the floaters when they happened even though some of them were indicated for waiting.

Besides, patients with uncomplicated PVD which have a 3.4% chance of retinal tear within 6 weeks rapidly. However, could reveal floater show for prevention from DR and permanent vision loss if left untreated (42). Hence, early to quantify the association between relevant clinical variables and risk of retinal tear in patients presenting with acute-onset floaters and its treatment become very important. According to the Byer’s study, the prompt and conscientious vitreo-retinal examination of each patient older than 45 years of age who experiences vitreous floater, it is the most effective way for preventing RRD. Of 163 patients who had one to two floaters as their presenting symptom, with or without light flashes, the retinal tear should develop in 7.3% of total patients. Therefore, Byre had concluded that in this early floaters stage when the symptom was detectable, it is crucial in terms of providing an opportunity for early treatment of vitreous floater that might prevent RD formation (43). Furthermore, Dayan and his colleagues also reported that retinal tear may be found in 26.7% of patients with PVD presenting with floaters alone. In their study, 295 patients with floaters were reviewed. 64% had only isolated PVD (the most common), 16.6% had DR and 31% had flat retinal tear. They further commented that floaters were as predictors of vitreo-retinal pathology (26). As Sharma and his co-workers, they found that vitreous floaters is the presenting symptoms of patients with PVD-related cases, flashes in 62% and both 51% cases within duration of less than 1 month (44). Now, due to the overuse of computers and smartphone, the case of condition of pre-mature cataracts, PVD and vitreous floater were increasing. PVD is even more accelerated after cataract surgery and 75.8 % eyes without preoperative PVD or lattice degeneration showed a higher incidence of RD after cataract surgery were noted. Furthermore, the incidence of RD with post-operative PVD after uneventful for phacoemulsification was 21.2 %. The onset of postoperative PVD should be considered an important risk factor for the development of RD after cataract surgery, particularly in eyes with lattice areas. We collected all the results and concluded that patients with vitreous floaters or any fibrils strands should arrange series of management according to the amounts and location of the “trouble” vitreous opacities (45).

In the past, observation is a negative concept because of the advanced vitrectomy techniques which could easily remove vitreous collagen and hyaluron with smaller instruments. Current surgical techniques are sutureless because highly shelved small gauge scleromies are self-sealing, obviating the need for sutures. Aspiration setting and cut rates are the same as typically used for vitrectomy, that is, between 400 and 600 aspiration and 1800 to 2500 cut per minute. The amount of vitreous removed varies from extensive with surgical induction of PVD, to limited without PVD induction and with preservation of 3 to 4 mm of retrolental vitreous. The preservation of retrolental vitreous is thought by some to mitigate cataract formation post-op. In addition, the amount of vitreous removed determines how much balanced salt solution is infused, varying from more than 10-15 ml in extensive vitrectomiest around 5 ml for limited vitrectomies. Future further enhanced control over how much and which parts of the vitreous body are removed (46). Although survey results showed the percentage satisfied ranged from 85% to 100% of participants, most of the peoples prefer food or nutrition supplement for treating floaters than operation (47).

There are many uses in pineapple and its derived ingredients. Along with papain, bromelain is one of the most popular proteases to use for cooking meat. The potential medical uses of the bromelain maybe due to its proteases. However, bromelain has not been scientifically proven to be effective in treating any diseases and has not been approved by the U.S. Food and Drug Administration for the treatment of any disorder. In USA, the passage of the Dietary Supplement Health and Education Act allows the sale of bromelain-containing dietary supplements, even though efficacy has not been confirmed. However, bromelain could be used as a known allergen. Currently, bromelain is used as a dietary supplement for nasal swelling, inflammation, osteoarthritis, poor digestion, osteoarthritis (Knee), increased heart rate, adjusting menstrual problems, cardiovascular disease, burn, wound care, pain control, antithrombotic, anti-inflammatory, various anti-cancer effects,
acute rhinosinusitis, preventing pulmonary edema, stimulating contraction, slowing the clotting system, improving the absorption of antibiotics, preventing cancer, reducing labor, and assisting the body eliminate fat, improving antibiotic absorption, minimizing the muscle soreness after intense exercise, relieving pain related to arthritis and knee concern, gout, bruises, ulcerative colitis, tendonitis, carpal tunnel syndrome and inhibiting the ability of colorectal cancer [48,49,50,51,52,53,54]. Moreover, bromelain is also claimed as a tooth plaque removal enhancer in toothpastes. Furthermore, systemic enzyme therapy consisting of combinations of proteolytic enzymes such as bromelain, trypsin, chymotrypsin, and papain were also prescribed. However, some of the peoples may induce allergic reactions to pineapples and we would pay attention to the phenomena. Fortunately, there were no special side-effects or discomfort in our treatment with pineapples.

Plant proteases have essential role in many regulatory processes associated with events in tissue growth and environmental change. In addition, the proteases are important in response to various stress such as wounding or proliferative phase. For example, the new protease “Anti-acanthini” was isolated from the “Bromeliaceae” which may be used to dissolve the proliferative fibrils in vitreous [55]. The cystein protease are the most abundant in Bromeliaceae including papain, bromelain and ficin [56]. In eclectic microscopy, we could easily found that insoluble fibrils could be de-polymerized to a soluble form by several proteolytic enzymes such as pepsin and ficin. Furthermore, the swollen fibrils should be found after digestion by pyrolytic enzymes. The above evidence should be used to explain why the patients taking pineapples may decrease their vitreous floaters. In fact, pineapples have a long tradition as a medicinal plant among the natives of South and Central America. Isolation of bromelain was recorded by the Venezuelan chemist Vicente Marcano in 1891 by fermenting the fruit of pineapple. In 1892, some authors investigated the matters more completely, and called it ‘bromelin’. Later, the term ‘bromelain’ was introduced and originally applied to any protease from the plant family Bromeliaceae. Bromelain from the pineapple is a mixture of protein-digesting (proteolytic) enzymes and several other substances in smaller quantities. Moreover, the proteolytic enzymes are sulfhydryl proteases; a free sulfhydryl group of a cysteine amino acid side chain is required for function. Now several researchers all found that bromelain is present in parts of the pineapple plant, but the stem is the most common commercial source, because usable quantities are readily extractable after the fruit has been harvested (57,58). According to classifications (E.C number): bromelain may be separated into 2 major extract components including stem bromelain (EC 3.4.22.32) and fruit bromelain (EC 3.4.22.33). However, stem-bromelain is distinguished from fruit-bromelain, previous called bromelain. These 2 enzyme number is not the same and, in other word, various biochemistry activities should be different in usage. Produced mainly in parts of the world where pineapples are grown, such as Thailand, Malaysia and Taiwan. Bromelain is extracted from the peel, stem, leaves or waste of the pineapple plant after processing the fruit for juice or other purposes. The starting material is blended and pressed through a filter to obtain a supernatant liquid containing the soluble bromelain enzyme. Further processing includes purification and concentration of the enzyme.

Vitreous may maintain the transparency for maximal photon transmission to the retina. Besides, vitreous may also maintain lens transparency by mitigating the effects of reactive oxygen species on lens proteins and thus preventing from cataracts. This antioxidant effect is primarily the result of high concentrations of ascorbate in vitreous, an observation originally made in 1944 by Friedenwald and colleagues. Therefore, another pathway to dissolve the vitreous opacities may be by the theory of reactive oxygenase species (ROS) which is very popular in many studies. For example, Yeh et al. found that ROS levels were significantly elevated in the vitreous fluid of proliferative diabetic retinopathy (PDR) patients, and patients with a more advanced clinical PDR appearance had higher ROS levels. Moreover, the ROS theories and oxidative stress might be correlated with PDR severity [59]. Besides, Akiba demonstrated that ROS may contribute to vitreous liquefaction which is a part of the normal ocular aging process and associated with vitreoretinal pathology. It is found that the hyaluronic acid, one of the main components of vitreous gel, could be degraded by ROS including free radicals. It is believed that the structural changes in vitreous may be caused by ROS [60]. Upon inflammation, the vitreous gel contracted and released a water-like liquid. In addition, superoxide dismutase can suppress the liquefaction, the destruction of the vitreous gel structure resulted from ROS generated from inflammatory cells. Although many unknown factors contribute to vitreous liquefaction, ROS may be the main cause of vitreous structure alterations. Recently, Bromelain was found to have anticancer effects and the mechanisms were explored by assessing the role in inducing ROS, superoxide, autophagosomes, and lysosomes. Therefore, the abilities to lower the higher levels of ROS in pineapple were considered as the
possible mechanisms of treating vitreous floaters by the effectiveness of bromelain (62). Müller and his co-workers also found that bromelain are cysteine proteases from pineapple, are known to have the Biochemical activities to decrease oxidative stress which may induce the rapid progression of floaters and PVD in vitreous cavity. As for the pathways, inhibiting NFκB/AMPK signalling as well as their downstream signalling proteins such as p-AKT, p-ERK, and p-Stat3 were the key role. Additionally, MMP9 and other epithelial mesenchymal-transition markers were partially found to be downregulated. Apoptosis was induced after bromelain treatment (62). Hence, in our therapeutic option that might open new insights for the treatment of human floaters, PVD and associated vitreous fibrils. Our studies revealed that the pineapple supplement every day can offer a cheap alternative to current therapies for the vitreous floaters which is the first report in the world.

There are several limitation in our study. Firstly, the amount of pineapple which we used is belong to 1, 2 or 3 pieces (each piece is approximate 120 g) which is easy calculated but the total taking amount deserved doubt. In the further, we may select another dedicated methods to be ensured to supply the exact food supplement. Secondarily, in the whole studies, the pineapples were from gained from City Kaohsiung, Tainan, and Pingtung, and randomly separated to the different groups for various treatment. We did not further trace the different extracts from the distinct geographic areas. Besides, we did not know if the bromelain from the 3 cities and its associated hydrolytic enzymes if they were the similar or not. At last, we did not further extract the more detailed biochemistry substances and the exact hydrolytic enzymes for lysing the vitreous floaters and strains. In our option, we will analyze the associated problems and true answers in the future.

Conclusion

To our knowledge, this is the first proven study that pineapple would effectively cut and clear the vitreous opacities and the associated vitreous strands which impact various physiological and psychological effects of eyes.

Furthermore, in this study, we found that pineapple significantly may dissolve and remove the vitreous floaters. The patients with acute-onset floaters and even flashes sometime led to severe VMT, macular holes and even RD which would induce blindness. In the experiments of our survey, we really found that pharmacystic vitreolysis from regular intake pineapple could decrease the rate of the vitreous floaters with less complication. Moreover, we did believe that pineapple supplement is suitable for the patients presenting floaters and the associated vitreous problems. Besides, we will further find out the exact biochemical properties and the real pathway in dissolving the vitreous floaters.

References