Fat rich foods have become an integral part of our life and are badly affecting a vast majority of the population. Gall stone is an example of one such disturbance in our body which needs medical attention and sometimes medical intervention in the form of surgery. The occurrence of gall stone is about 10% worldwide and a potential threat to the society specially women. Cholesterol stones are the most common gall stones with some instances of bilirubin stones. A basic understanding of the diet and symptoms of the gall stone would guide the affected towards a gentle care. Present review emphasizes on the basic understanding of the etiology of different gallstones, knowing the symptoms and its diagnosis, diet plan to avoid it and finally the treatment using different medical intervention.

**Keywords:** Cholesterol, Bilirubin, ESWL, Cholecystectomy, silent stone.

**INTRODUCTION**

Suffering pain in the upper abdomen, often more to the right and moving to the right shoulder blade or shoulder tip, accompanied by nausea and vomiting? Get it checked, it could be gall stone. Gall stones are formed in the gall bladder, a pear shaped small sac that lies underneath liver at the right side of the abdomen. It is a hollow inactive organ of the digestive system that holds your bile juice for sometimes. A common bile duct one each from left and right lobe of liver collects the bile juice and stores it in the gall bladder. The bile juice is a green viscous fluid containing bilirubin and biliverdin pigments and helps in the digestion of fatty foods in the intestine. Bile juice contains water, cholesterol, lecithin, bile salts, proteins and pigments. It is made up of soap like substance that keeps the cholesterol in gall bladder in liquid form. When we eat a fatty meal, a hormone called cholecystokinin is secreted by the duodenal mucosa which causes the contraction in gall bladder and thus releasing the bile juice for the digestion and absorption of fat in the intestine. Epithelial mucosal cells, especially goblet cells secrete a kind of protein called ‘mucin’ which is a derivative of MUC genes and has an evident biological role in the formation of gallstones (Dayan et al., 2004). The duct that comes out from the gall bladder is called cystic duct which moves through the pancreas while releasing the bile juice in the intestine and at the same time pancreas also releases its digestive juice at the same place in the intestine. Gall bladder even though functions as a reservoir of bile juice and releases it at the time of fat digestion, but its absence does not make much difference in an individual as not being a vital organ. After the gall bladder is removed, bile flows directly from the liver to the intestine and the digestion proceeds normally.

Gall bladder thus has a continuous function as per the food intake of an individual. Our liver produces as much as 1-2 litres of bile juice in a day for digesting the fat. There occurs some imbalance in the composition of bile juice which results in some disturbances in the digestion process in one hand while accumulation of some bile components in the bladder on other hand resulting into the formation of the gall stone(s) (Carey, 1993).

**Nature of gall stones and its symptoms**

They are clumps of a solid material whose size ranges from as tiny as sand grains to as big as a tennis ball. Gallstone formation is always associated and accompanied by two major steps, viz., metabolic abnormalities and physical-chemical events in the body. In most of the cases, cholesterol sediments and form cholesterol rich stone but sometimes bilirubin pigment also settles to form a darker colored stone. There are instances of gall stone formation where a mixture of these two (cholesterol and bilirubin) have also been...
documented. Altered bile salt metabolism is based upon the impairment of cholesterol metabolism and homeostasis (Tazuma, 2008). Gall bladder can develop just one or two large stones but accompanied with many sand like stones to create disturbances in the normal physiology of an individual. Sometimes these small stones aggregate to form a large stone which resembles the shape of a custard apple. Often, gallstones are asymptomatic, i.e., it may remain “silent” for years and years and may not cause any symptoms at all. Such gallstones are usually discovered accidentally during tests for other problems and they do not need treatment. Among the general populations, incidences of gall stones have double the frequency in females than in males (Acalovschi et al., 2003).

Gall stone causes symptoms when they plug the outlet from either gall bladder or the bile duct. The pain associated with gall stone is usually a crampy feeling at upper abdominal region, bloating, nausea and vomiting. Sometimes the gall stone induces other complications, such as infections, jaundice or pancreatitis. The pain is so unbearable that the patients could not resist it and rushes for medical attention.

Pathophysiology and diagnosis of the gall stones

Basically these stones block the passage of bile juice and create disturbances in the normal physiology of an individual. The stone may form either in the common bile duct (collects bile from liver and brings to the gall bladder) or in the cystic duct (collects bile from gall bladder and releases it to the intestine). Most commonly stone is formed in the cystic duct and it blocks the flow of bile from gall bladder leading to the inflammation of gall bladder, called cholecystitis. Less common but equal complications may arise if stones lodge in the common bile duct heading to the inflammation of pancreas, called pancreatitis. Prolonged blockage may lead to the failure of functioning of some vital organs and may prove fatal in some cases.

Followed the pain at right upper abdomen with feeling of nausea and vomiting, a patient is advised to visit the nearest physician. Such attack may last for 30 minutes, more often it lasts for even hours. The affected must take clinical advice followed by certain tests that will keep the health check of the patient. Certain suggested clinical tests are listed below:

Ultrasound

Also known as ultrasonography, uses sound-waves to detect the obstruction in normal physiological pathways. As it is a non-invasive diagnostic technique, it sends sound waves which bounces back to the detector indicating the presence of some object (generally stone).

X-Rays:

Even though a radiation penetrates through the cellular bed of the body, it is more reliable than ultrasound as far as detection of the stone is concerned. Children and pregnant women are very susceptible to the X-rays exposure and are suggested for other diagnostic procedures like ultrasonography. There are several kinds of X-rays done to detect the stone in the gall bladder:

i) Oral Cholecystography

The patient is allowed to swallow an oral pill containing halogenated dye a night before the test and is filmed using X-ray technique the next morning. The patient should be examined thoroughly to ensure any allergic reactions from the halogenated dye as its traces may remain as a result of incomplete elimination.

ii) Percutaneous Transhepatic Cholangiography (PTC)

A very thin tube (catheter) is injected through the abdomen and guided to the bile duct system via liver. A halogenated dye is injected to outline the network of gall bladder and associated ducts and captures the X-ray images of the ducts thereby identifying the stones.

iii) Endoscopic Retrograde Cholangiopancreatography (ERCP)

An endoscope is channelized through the mouth opening via oesophagus and reaches to the small intestine where it injects the dye in the common bile duct which helps in making a sharp X-ray image of the stone. As the diagnostic procedure involves invasion of endoscope, there is a huge possibility of cellular damage which sometimes becomes non-repairable leading to surgical options. If during the examination, it is found that there are stones in the bile ducts, the endoscope can be used to remove the stone at the same time and thus can be used as a treatment tool too.

Who are at risk?

The incidence of developing gall stone occurs more often in women than in men; although anyone could get affected by it. People aged between 20 and 60 are prone towards developing gall stones. Women with pregnancy and the one who have used oral contraceptives or menopausal estrogen therapy at young stage are at the higher risk zone. Sudden
decrease in the body weight of an individual contributes to the gall stone formation. Even the overly weighed people have fair chances of getting the gall stones. After the age of 50 is attained, even the healthy individuals, especially women are advised to take a regular health check-up which should include gall bladder status too. Patients with gall stones have to be very careful in its understanding, diagnosis and prognosis as 75% cases of gall bladder carcinoma (cancer) patients have reported to have gall stones (Bortoff et al., 2000).

Dietary suggestions

Body ailments of an individual are always affected by the kind of their food intake, its timing, appetite and quantity of food. Many diseases are controlled solely by keeping a check in the patient’s diet plan. Diet rich in cholesterol, starch, sugar etc. has been found contributing in its formation. High fibre content in the diet is always recommended by the medical practitioners to avoid constipation as it plays one important role in its formation (Kameda et al., 1984; Scaggion et al., 1988). Fasting and crash dieting increases the chance of concentrating the bile juice with more cholesterol and thereby increasing the chances of getting gall stone (Gaby, 2009).

Treatment and biotechnological intervention

Once the stone is diagnosed correctly in either the gall bladder or the ducts surrounding the bladder, it needs the surgeon’s intervention to get rid of the stone and its associated pain. Biotechnology has to play a pivotal role in inhibiting the formation of such stones in the duct and gall bladder but the basic understanding of the genes associated with the formation of bile juices has to be deciphered on the first note. There are people in remote rural areas who still practices “Jadi-buti” and treat the gallstones using some plant extract. Researchers need to explore the inhibitors present in those traditional medicinal plants against the stone forming factors and its possible role in its partial or complete inhibition.

Although in many cases, the pain is silent, but sometimes depending upon the case, surgical removal of the gall bladder or stone becomes necessary. Certain blood tests and liver function test suggests the enzyme chemistry of the vital organs participating in the digestion process, leading to clinical intervention using surgical processes. Following methods have been devised for surgical removal of either gall bladder or gall stone:

A. Cholecystectomy

Gall bladders are best treated by a surgical process called ‘Cholecystectomy’ which involves surgeons to remove the gall bladder as a whole. Traditionally it was done by open surgery through a long cut under the right edge of the rib cage but now-a-days ‘key-hole’ surgery is in practice where a 2-3 cm long incision is made at the navel point and other three very small very small incision (0.5-1 cm) is made to channelize the instruments (Bortoff et al., 2000). This ‘key-hole’ surgery is also called ‘laparoscopic cholecystectomy’. Depending upon the cases, the surgery usually lasts up to 1 to 2 hour and is done under general anesthesia. Sometimes, the gall stone disease has been found associated with liver cirrhosis, which further complicates the case (Dario et al., 1990; Michael and Ternce, 2005).

B. Extracorporeal Sound Wave Lithotripsy (ESWL)

In this technique, the treatment is done by producing high energy shock waves in vitro and is administered through skin and body tissues until obstruct by some denser region and turn them into small pieces. Even though this technique was designed for treatment of kidney stones and is being practiced in almost 90% cases (Kumar, 2011), but at few places, these shock waves are used for gall stones too in combination with some drugs (Ursodiol and Chenodiol) that dissolves the fragmented stone further. The number of stones and its size are two important determinants of the clearance time after lithotripsy is done in patients. (Sackmann et al., 1998)

Future needs

It is important to remember that each individual differs in their genetics and so about the response to an ailment and its treatment. The article has been prepared by keeping most common features into consideration which suits the majority and cannot replace the professional advice and expertise of a doctor who knows your condition better. Therefore, there is a dire need of developing better infrastructures and better imaging facilities in the government hospitals which is more accessible to majority of the population. Extensive research plans on the molecular understanding of the genes and its potential function will improve the designing of biological inducers and suppressers to inhibit the formation of gallstones. Gene targeting has been proved to be a potential tool in the therapeutics of many diseases and un-natural body conditions and can be used to target gallstone formation.
REFERENCES


