

Nabhi Marma- An Embryological and Anatomical Focus

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Abstract:

Nabhi is a term of varied importance. It has relevance as a vital spot (Marma) and as a regional landmark. Its clinical and functional importance is based on these grounds. It is therefore worthy to consider the embryological and anatomical concepts of *Nabhi Marma* to explore its constitution, location and applied aspects. Some of the structures of the body like organ for storage of undigested food (*Amashaya*), digested food (*Pakvashaya*), retention of digesting food (*Grahani*) etc are described by locating *Nabhi*. The injuries afflicting *Nabhi Marma* leads to immediate death or death within seven days. The traditional technique of martial art called Kalari follows some steps to defeat the enemy by directly blowing on the umbilical region. The structural analysis of this *Marma* can help to prove the instant fatality. Therefore there is need to review Ayurvedic and contemporary literature to understand the vulnerability of *Nabhi Marma*.

Key words: Embryological importance, Anatomical importance, *Nabhi Marma*, Instant fatality

Introduction:

Marma is the term used to denote the vital spots of body. [1] These are the sites where vital energy (*Prana*) exists. [2] It is made out of a combination of muscle (Mamsa), vessels (Sira), fibrous connective tissue and nerves (*Snayu*), bone (Asthi) and joint (Sandhi). [3] *Nabhi Marma* is one among the 107 *Marma* explained in the science. If injured, it can lead to immediate death [4] and so is counted as one among the *Dasa Pranayatana*. [5] All the *Pranayatana* extending from head to below are located towards the midline of the body. Likewise the *Marma* that are located in the trunk are more relevant than that on the extremities. [6] This signifies the relevance of *Nabhi Marma* lying in the center line of body, structurally made of *Sira* belonging to the abdominal region. [7]

Abdomen is the distensible part of the trunk comprising most of the visceral organs. It has less

skeletal frame work but well guarded by tough musculature. The soft organs present in the abdominal cavity with its rich vascularity accounts for its sudden response to systemic and traumatic conditions. The clinical presentations can be hemorrhage, aneurysm or ischemia. Abdominal vascular injuries are quite common. The overall mortality rate due to it is 45%. The incidence of various types of trauma was blunt in 11%, gunshot wounds in 70%, shotgun wounds in 4%, and stab wounds in 15%. The three vessels with the highest mortality rates were aorta (at and proximal to the renal artery) (91%), hepatic veins and/or retro-hepatic vena cava (88%), and portal vein (69%). [8] Different aspects of *Nabhi*:

The term *Nabhi* is derived from words 'nah' and 'bande'. [9] It means to bind or tie to the central point just like the spokes of wheel held at the nave. *Nabhi* is described as located between the organ for

storage of undigested food (*Amashaya*) and the organ for storage of digested food (*Pakvashaya*). [10] So it is an anatomical landmark to locate these organs.

There are 700 vessels (*Sira*) [11] and 24 pulsating vessels (*Dhamani*) [12] in the body. They originate from the *Nabhi* and moves in the three directions - i.e. upwards, downwards and transverse. The vital energy (*Prana*) of an organism is situated in the *Nabhi* which is surrounded by the vessels just like spikes of wheel. The *Nabhi* of fetus and the heart of the mother are bound by connecting cord (*Nabhi Naadi*). [13] It provides nutrition to the fetus. Developmentally *Nabhi* is derived from mother. It is the special seat of Pitta. [14]

Pathologically, a type of hiccup (*Gambhira Hikka*) takes its origin from *Nabhi*. [15] Also in urinary calculus (*Asmari*), *Nabhi* is the site of referred pain. [16] In accumulation of urine (*Mootra Jatara*) the urine get accumulated below *Nabhi*. [17] *Nabhi* is a seat of internal abscess (*Abhyanthara Vidradi*), as a result of which hiccup will be seen. [18]

Contemporary Views:

Umbilicus is the central point of the body which is made of dense fibrous tissue. Its position is variable. In healthy adults, it lies in anterior median line at the level of disc between L₃ and L₄ vertebrae. It is lower in infants and in persons with pendulous abdomen. Anatomically, the abdomen is divided in to 9 regions, by the trans-pyloric and trans-tubercular plane horizontally; the two mid-clavicular line vertically on either sides. As a region, umbilical region is the intermediate zone among the nine regions of abdomen.

The important structures coming below and deep to the umbilical region of abdomen include the second part of duodenum, pancreas, the inferior-vena cava, abdominal aorta and its branches. The main branches of abdominal aorta are celiac trunk, superior mesenteric artery, inferior mesenteric artery and finally divide in to external and internal iliac artery. [19]

Embryologically, umbilicus represents the attachment of foetal end of umbilical cord. In early

part of intra-uterine life it transmits the vitello-intestinal duct and allantoic diverticulum. The vitello-intestinal part communicates the primitive midgut with extra-embryonic part of the yolk sac (umbilical vesicle). It is surrounded by umbilical coelom, site of communication between intra- and extra-embryonic coeloms. In 98% cases vitello-intestinal duct disappears later. Up to 10th week of IU life the umbilical coelom persists, and the latter contains a loop of midgut. Umbilical coelom thereafter obliterates and herniated midgut-loop re-enters the abdomen.

The allantoic diverticulum extends from primitive urogenital sinus (endodermal cloaca) to foetal end of umbilical cord. The lumen of diverticulum obliterates later, its wall forms urachus, converted to median umbilical ligament at birth. Median Umbilical Ligament extends from apex of urinary bladder to umbilicus. [20]

Discussion

The central point of the body is termed as *Nabhi*. *Nabhi* is taken as a superficial landmark to locate the *Amashaya* and *Pakvashaya* in relation to *Stana* cranially and *Sroni* caudally. Umbilicus is lying midway between the suprasternal notch and symphysis pubis. It is the central point of the body. From this point of view *Nabhi* has to be considered as the umbilicus and the region around it.

The location of *Nabhi Marma* is grossly mentioned between *Amashaya* and *Pakvashaya* which doesn't give idea about precise site of *Marma*. *Amashaya*, where undigested food is present can be correlated with the stomach. *Pakvashaya* is the site of fecal matter, which is correlated with colon. The trans pyloric plane passes through pyloric region of stomach at L1 level and trans tubercular plane is passing at L4 level below which lies the rectum and anal canal. This demarcates the boundaries of umbilical region of abdomen (out of 9 regions).

Umbilicus is a surface land mark of umbilical region, lying immediately above the trans tubercular plane. Thus *Nabhi Marma* can be

located in umbilical region.

According to the classical descriptions it is not clear that the 4 *Angula* size of *Nabhi Marma* is in terms of length, breadth or depth. As observed in the cadaveric dissection, the 4 *Angula* circumference and depth around the umbilicus have more relevance. This can be understood by studying the structural composition of *Nabhi Marma*.

As per dissection conducted on cadaver the structures coming under the umbilical region include part of stomach, greater omentum, 2nd to 4th part of duodenum, 2/5th of small intestine i.e. Jejunum, ileum, root of mesentery (L2 level), transverse colon and mesocolon, head of pancreas (L1&L2 level), lower pole of kidneys (L3 level), beginning of abdominal part of ureters, superior mesenteric arteries (L1 level), inferior mesenteric arteries, (L3 level) with autonomic plexus, bifurcation of abdominal aorta (L4 level), beginning of inferior vena cava (L5 level), formation of portal vein (L2 level), dermatomes passing through are T9, T10, T11, T12, anastomoses between superior and inferior epigastric artery, psoas major muscles, right and left crura of diaphragm, body of L1 to L5 vertebrae with intervertebral disc.

Structurally, however, *Nabhi* is a *Sira Marma*. The word *Sira* is used in Ayurveda as a tubular structure carrying the *Rasaadi Dhatu* which refers to the vascular system. The vascular structures falling under umbilical region are abdominal aorta, inferior vena cava, superior mesenteric artery with branches, anastomosis between the superior epigastric and inferior epigastric artery. They are structurally and clinically vulnerable.

The modern researches establish it firmly. In the present scenario, emergency life care has advanced to a marked extent. Penetrating aortic injuries still have a very high mortality rate with no improvement in survival, despite improved trauma services. Traumatic injury of the proximal superior mesenteric artery shows similar effects. Fifteen consecutive patients with this injury, 13 injuries from gunshot wounds and two injuries from blunt trauma have been treated. Associated lesions and massive

blood loss were common averaging 3.6 injuries and 4800ml per patient respectively. There were 5 deaths (33%) with four occurring from acute hemorrhage and one late occurring following intestinal necrosis and sepsis [21].

An injury to a *Marma* can lead to a condition called shock. It is a circumstance in which homeostasis is disrupted. A universal physiologic threat to the patient in shock is deficient oxygen delivery to the mitochondria of cells. As cells die, organ failure ensues. A wide range of mechanisms cause shock. It can be hypovolemia, sepsis, cardiac disease, electrolyte imbalance, adrenal insufficiency. Profound hemorrhage leads to a rapidly lethal form of shock; a sustained period of a modestly reduced oxygen delivery leading to irreversible intracellular dysfunction is just as lethal.

The root of vessels (*Sira*) and (pulsating vessels) *Dhamani* is *Nabhi*. It can be explained only with the help of embryology. *Sira* and *Dhamani* in Ayurveda represent the vascular system of the body which includes the arteries and veins. The description on development of arterial system explains this more clearly. The angioblasts developed in the yolk sac and allantois communicates with placenta through umbilical cord. The embryo is nourished through the umbilical cord connecting placenta to the umbilicus. The cord is formed from the amnion. Amnion has a circular attachment to the margins of umbilical opening and forms a wide tube. It contains the vitello-intestinal duct and remnants of yolk sac. The extra-embryonic mesoderm of the connecting stalk which is later converted to Wharton's jelly, blood vessels that pass from embryo to placenta and a small part of extra-embryonic coelom are the other contents. This is responsible for the nourishment of the embryo.

This can be explained by emphasizing the embryological and anatomical importance. The three systems of body i.e., digestive (vitello-intestinal duct), excretory (urachus) and vascular (umbilical vessels) have their connection there. If a horizontal line is drawn across the umbilicus it acts as a

'watershed line'. The subcutaneous lymphatics from upper area of abdominal wall drain bilaterally in to axillary lymph nodes. Those from lower area drain bilaterally in to superficial inguinal lymph nodes. Malignant skin growth at the level of umbilicus undergoes widespread lymphatic metastasis.

Para umbilical vein, a tributary of portal vein, communicates with number of tributaries of systemic veins around umbilicus. In portal obstruction, the subcutaneous tributaries of systemic veins are distended like spokes of a wheel around umbilicus. This phenomenon is *caput medusa*.

The umbilicus is a site of referred pain. Somatic abdominal pain in the abdominal wall can arise from the skin, fascia, muscles and parietal peritoneum. The T7- L1 is the cutaneous nerve supply to the umbilical region of abdomen. The painful conditions affecting visceral organs having the same nerve innervations as the umbilical region will lead to referred pain.

By above discussion pertaining to gross anatomy, developmental anatomy and clinical aspects it is revealed that *Nabhi Marma* is not a single structure but an entity constituted by very complex structural arrangement in the umbilical region. Therefore *Nabhi Marma* can be located in the umbilical region within 4 *Angula* depth and circumference.

Conclusion:

The *Nabhi* can be correlated with the umbilicus. Based on the literature review and practical observation, Sthana of *Nabhi Marma* can be ascertained in the umbilical region of abdomen within the 4 *Angula* circumference and depth. As per dissection for structural composition of *Nabhi*, it is observed that *Nabhi Marma* is not an organ but a region under which many neurovascular, visceral and skeletal structures are present. Being a *Sira Marma* the vascular structures coming under the umbilical region are vital. The abdominal aorta, inferior vena cava, superior mesenteric artery with its branches, anastomosis between superior epigastric and inferior epigastric arteries, are clinically vulnerable. The direct penetrating injury to these vascular structures will lead to internal

hemorrhage and shock. Apart from that occlusion occurring to superior mesenteric artery can result in embolus, thrombus etc. which are also fatal conditions. These injuries may cause life threatening conditions eventually results in death if not managed properly. Based on this its fatality can be proved.

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