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Contents **Page**

International Journal of Anatomical Sciences 2011, 2(2):19-21

Case Report

Crossed Fused Renal Ectopia – a Case Report

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Key words: crossed renal ectopia, nephrolithiasis, accessory renal artery

Abstract: Ectopic kidney occurs as a result of a halt in migration of kidneys to their normal location, during the embryonic period. Due to their ectopic position and aberrant vascularity, they are more prone to many diseases such as urinary tract infection, renal stones, hypertension etc. The clinical features are not peculiar of renal diseases and needs sophisticated investigations to fix the exact diagnosis. A case report about an ectopic fused kidney is presented here for its rarity and clinical significance.

In adult, the kidneys are situated in the lumbar region as a retroperitoneal organ. They originate in pelvic cavity from the metanephros during the embryonic period. Due to rapid differential growth of the caudal end of the embryo, they migrate cranially and rotated medially to reach their final location.

Crossed fused renal ectopia refers to a rare congenital anomaly (Daniel and Datnow, 1977; Debnath et al., 2003; Boyan et al., 2007); where the kidneys are fused and located on the opposite side of the midline in relation to its ureteric orifice in the urinary bladder. The estimated incidence of this anomaly is around 1 in 1000 live births, with male predilection of 2:1. In addition to that, left to right ectopy is three times more common.

Renal ectopic may present a diagnostic problem when it get diseased acutely, because the clinical features are different from that of produced by the normally located kidney. A case of ectopic fused kidney is presented here for its rarity and clinical significance.

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Case Report

During routine cadaver dissection, in the dissection hall of the Institute of Anatomy, Madurai Medical College, we came across a mass in the right iliac fossa of 50 year old male cadaver. While analyzing the mass we confirmed that it was a fused renal mass. Understanding the rarity of the specimen we carefully dissected and recorded its position, relations and blood supply. Photographs were taken for documentation (Fig. 1).

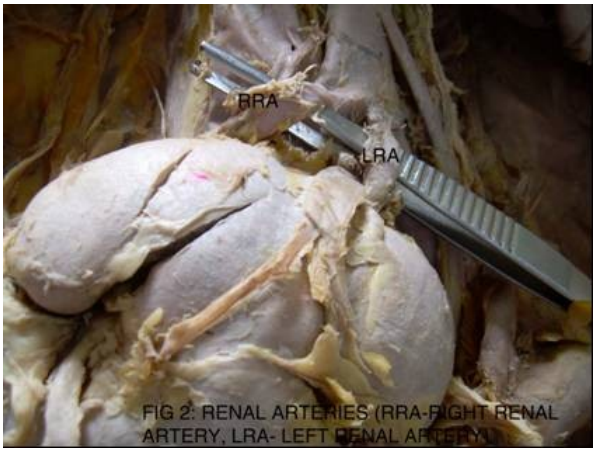
The fused ectopic renal mass in the right iliac fossa showed following anatomical features: the renal mass was situated in front of the right iliacus muscle and sacrum and partly in the right pelvic brim. Careful analyzes revealed that the left kidney crossed the midline and came to occupy the right iliac fossa and right kidney failed to ascend and present in the same right iliac fossa. Both the kidneys were fused transversely and appeared like a disc in shape. Two distinct hila were seen; one at 1cm right-lateral to the midline and other was present in the right end of the renal mass. There were two renal arteries from the aorta just before its bifurcation in front of

IJAS 2011, 2(2): 19-21

the sacral promontory, and entered the respective hilum. In addition there was a small accessory renal artery from the left common iliac artery which entered the left end of the renal mass. Corresponding renal veins drained in the inferior vena cava and left common iliac vein. Right ureter had normal anatomical course, but the left ureter crossed the midline and passed behind the sigmoid colon and both ureters opened typically in the urinary bladder. Supra renal glands were present in the normal anatomical position with reference to kidneys and there was no change in their vascularity. No other anomalies were noted.

Fig. 1 Ectopic Fused Kidney

Fig. 2 Renal arteries to the fused ectopic kidney



(RRA – Right Renal Artery; LRA – Left Renal Artery)

Discussion

Renal fusion and anomalies were first studied and classified by Wilmer, (1938) later it was revised by McDonald and McClellan, (1957). They classified the ectopic sequel into four major types as

1. Crossed ectopia with fusion
2. Crossed ectopia without fusion.
3. Solitary crossed ectopia and
4. Bilaterally crossed ectopia.

Crossed ectopia with fusion type is further sub classified into

1. Unilateral fused kidney with inferior ectopia : in which the crossed kidney lies inferior to the resident kidney. The upper pole of the crossed kidney is fused to the lower pole of the resident kidney
2. Sigmoid (or) S shaped, kidney: The crossed kidney lies inferiorly with its pelvis directed laterally. The pelvis of the superiorly located resident kidney is directed medially.
3. Unilateral lump kidney: The kidneys are fused along their medial borders. The renal pelvis of the resident kidney is directed anteromedially and the crossing renal pelvis directed laterally.
4. L shaped kidney: The crossed kidney lies inferiorly and transversely.
5. Unilateral fused kidney with inferior ectopia. The crossing kidney lies superior to the resident kidney. Both renal pelvises are anteriorly rotated.

In our specimen the fused mass was disc shaped both pelvises were directed antero medially.

The factors responsible for this type of ectopia and fusion were still undetermined. However, Wilmer (Year) suggested that

crossover occur as a result of pressure from abnormally positioned umbilical arteries that prevent the normal ascent of the kidney which then follows a path of least resistance to the opposite side.

Some more proposed theories are:

A. Faulty ureteric bud development.
B. Teratogenic factors.
C. Abnormal variation in the growth of the hind gut.
D. Abnormal position of the caecum.

However mechanical factors alone do not provide comprehensive explanation. When one considers that cardio vascular and skeletal anomalies associated with renal ectopia. Most of the time, the renal ectopia is associated with Vertebral, anorectal, cardiac, trachea - oesophagel, renal and limb (VACTERL) anomalies (Gray and Skandalakis 1972; Russell et al., 2000).

More than one anomaly can occur at the same time, while kidney ascend through the pelvis they receive new arterial branches from vessels (iliac / aorta) close to them. When they finally reach the lumbar region they receive the new branches from abdominal aorta and the former branches degenerate . In ectopic kidney they don't degenerate and present as accessory renal arteries. Several studies showed that hypertension is more frequently encountered in cases with more than one renal artery in each side. These accessory renal arteries may compress the pelvis and ureter and can produce obstructive hydronephrosis. In our study there was one accessory renal artery from left common iliac artery which entered the left and of the renal mass which may be the non-degenerated portion of the embryonic accessory renal artery. Thus gives an indication that the prelude to the anomalous pattern of kidneys seen in this study could embryologically originated from this accessory renal artery.

Conclusion

Most patients with renal ectopia do not have symptoms and are diagnosed incidentally. But these anomalies are more prone to develop recurrent urinary tract infections (due to stasis), nephrolithiasis, trauma, hydronephrosis and hypertension (due to anomalous vasculature). The ectopic kidney when diseased the clinical features are not classical and sophisticated investigations are needed to fix the diagnosis.

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International Journal of Anatomical Sciences 2011, 2(2): 22-25

Research Paper

Duplication of Great Saphenous Vein in South Indian Population

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Key words : Great Saphenous vein, Duplication, Varicose veins.

Abstract: The great saphenous vein is the conduit of choice as a graft in coronary artery bypass arterial reconstruction and for valvuloplasty in medical and surgical practice. The great saphenous vein is also used for bypass obstructions in case of atheromatous occlusion of the femoral and coronary arteries. The duplication of great saphenous vein is a frequent cause of failure to achieve the expected results following primary ligation for the treatment of varicose veins. The current study was therefore focussed on duplication of great saphenous vein and its incidence in South Indian population. For this purpose a total sample of 70 adult specimens of both sides, 22 male and 13 female cadavers were used. The results were analysed by dissection method. For this, the incidence is used as parameter. Duplication was observed bilaterally in one cadaver with the incidence of 3% which correlates with western population. The results conclude that precise knowledge about normal anatomy of great saphenous vein with their variations becomes mandatory for a successful clinician. The study about this fact by our Indian authors was scarce. Hence an attempt was made in the present study to find out duplication of Great saphenous vein in South Indian population.

The great saphenous vein originates from the inner part of the dorsal venous arch of the foot, by the union of medial end of dorsal venous arch and medial marginal vein. After its formation, it passes in front of the medial malleolus, single trunk lying along the posteromedial aspect of the knee joint, receiving anterior and posterior tributaries along its course, one hand breadth posterior to the patella, and then upto the fossa ovalis or saphenous opening (4 cm below and lateral to the pubic tubercle) where it enters the femoral vein (Williams *et al.*,2005).

The variations are more common in the upper segment of great saphenous vein, where it ends near the femoral vein. Common cause of recurrence of varicosities after high ligation and stripping are said to be failure to ligate the duplicated great saphenous vein if any (Linton, 1938; Sherman, 1944; Summers, 1953). The incidence and pattern of duplication have drawn attention to the possible role of its variation as a source of recurrent varicose veins (Kosinski, 1926; Glasser, 1943; Daseler, 1946; Haeger, 1977; Corrales, 2002).

A thorough and effective knowledge of the anatomical variations of the great saphenous vein like duplication, determines

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IJAS 2011, 2(2): 22-25

the good results of medical and surgical management.

Materials and Methods

The study was conducted in seventy adult specimens of both sides including 22 male and 13 female cadavers of age group 40 to 60 years, over a period of three years, in the department of Anatomy, Sri Ramachandra Medical College & Research Institute, Chennai. By dissection method, the course of great saphenous vein from the medial malleolus to the sapheno-femoral junction in both legs, the duplication of great saphenous vein with their termination into femoral vein and its tributaries were traced.

Observations

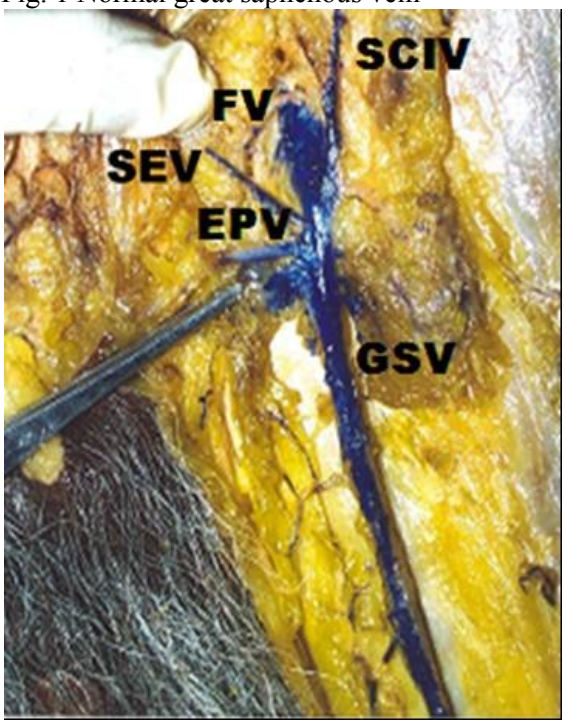
Out of 70 specimens dissected (Table-1), in 68, the great spahenous vein was seen normal (Fig. 1) and the duplication of the great saphenous vein was observed only in one male cadaver bilaterally (Fig. 2 and 3). In the duplicated vein, the level of termination and their drainage pattern along with their terminal tributaries were noted separately for both sides. On both sides of a male cadaver, the duplicated vein was found to terminate into the femoral vein. On the right side, the distance measured between the anterior superior iliac spine and sapheno-femoral junction was 9.7 cms and on the left side it was 10.1 cms. The sapheno-femoral junction was found to be 4.2 cms lateral to pubic tubercle on the right side and 4.5 cms lateral to pubic tubercle on the left side.

Table-1 Details of cadaver samples studied for great saphenous vein

Sex	No of Cadavers	No of Speci-mens	Duplica-tion	Normal
Male	22	44 limbs	2 limbs	42 limbs
Female	13	26 limbs	-	26 limbs
Total	35	70 limbs	2 limbs	68 limbs

On observing the drainage pattern of the right side, the duplicated great saphenous vein on the lateral part of the thigh drained into the femoral vein at the fossa ovalis along with the superficial circumflex iliac vein whereas the duplicated vein observed on the medial part of the right side drained into the femoral vein at the fossa ovalis along with the external pudendal vein and superficial epigastric vein (Fig. 2) Similarly on the left side, the medially observed duplicated vein drained into the femoral vein at the fossa ovalis along with the external pudendal vein whereas the laterally observed duplicated vein on the left side drained into the femoral vein at the fossa ovalis along with the superficial circumflex iliac vein and superficial epigastric vein (Fig. 3) No other abnormalities were detected in the specimen other than duplication. The remaining 68 specimens showed normal course and pattern of great saphenous vein without any duplication.

Fig. 1 Normal great saphenous vein



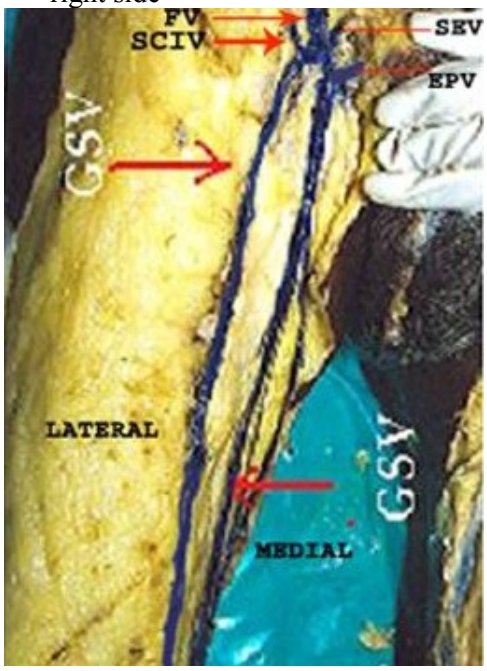
(FV-Femoral vein;SCIV - Superficial circumflex iliac vein;SEV-Superficial epigastric vein;EPV- External pudendal vein;GSV-Great saphenous vein)

Discussion

The great saphenous vein has an important role as autograft for arterial by-pass surgery (Shah *et al.,* 1986). A proper understanding of the anatomy of the super-ficial veins is elementary for improving the results of operative treatment. Duplications

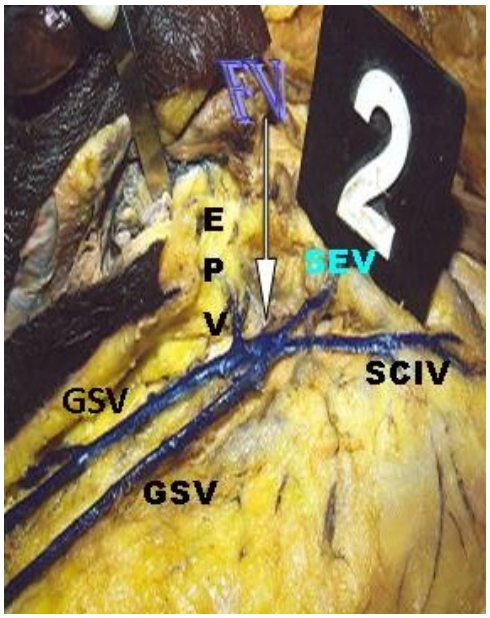
of great saphenous vein are often demonstrated by dissection during arterial bypass surgery.

Fig. 2 Duplication of great saphenous vein on right side



(FV-Femoral vein;SCIV-Superficial circumflex iliac vein;SEV-Superficial epigastric vein;EPV-External pudendal vein;GSV-Great saphenous vein).

Fig. 3 Duplication of great saphenous vein on left side



(FV-Femoral vein;SCIV-Superficial circumflex iliac vein;SEV-Superficial epigastric vein;EPV-External pudendal vein;GSV-Great saphenous vein)

Clinicians unfamiliar with venous insufficiency, particularly disorders of the superficial venous system like duplication, often underestimate the complexity of the problem and the importance of proper evaluation before initiating treatment. In addition to a directed history, evaluation and physical examination, additional evaluation with use of a variety of non-invasive diagnostic instruments, including duplex ultrasound, may be necessary before the treatment of varicose disease (Ricci, 1999) for determining the cause and severity. The precise anatomy of the great saphenous vein should be determined preoperatively by phlebography since this information is valuable for proper surgical planning before vein is used as a graft or for in situ bypass in the lower extremity. Phlebography (Saphenography) is a reliable method for pre-operative assessment of variations and connections of great saphenous vein especially when anteroposterior and lateral images are taken (Shah *et al*.1986; Veith *et al*., 1979).

Glasser (1943) reported and classified the venous drainage at the region of fossa ovalis into 19 sapheno-femoral drainage patterns after dissecting 50 bodies (100 limbs) and according to him duplication belongs to Type-V B which shows double great saphenous vein joining at the fossa ovalis with the incidence of 3% . In the present study (South Indian population), the duplication was found bilaterally in one male cadaver with the incidence of 3% which correlates with the study of Glasser (1943) in Western population. Similar reports and references in South Indian population regarding duplication of great saphenous vein were scarce to compare and correlate our present study. Hence many reports from South Indian population are awaited.

Conclusion

A thorough understanding of the anatomical variations of great saphenous vein is important in providing information for the vascular surgical operations concerning with lower extremity. Further studies are required involving more samples

to gather information pertaining to frequency of true duplications of the great saphenous vein in Indian population.

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International Journal of Anatomical Sciences 2011, 2(2): 26-30

Research Paper

Evaluation of the Emotional Impact of Cadaver Dissection in Medical Students at the Entry Level

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Abstract: Teaching anatomy is based on cadaver dissection. Working with cadavers through active dissection constitutes a potential stressor in medical education. To reduce the anxiety level by mentally preparing the student before going to the dissection hall, two questionnaires were distributed among 140 first year medical students. The pre-dissection questionnaire comprised of questions relating to demographics and the first encounter with a cadaver. Then all the students were randomly divided into two groups. One group was counseled psychologically prior to dissection and the other group had no such preparation. After the first dissection class all the students were surveyed by a questionnaire which included physical and cognitive symptoms of anxiety, resulting from exposure to the dissection hall at the first visit. There was a significant difference $p<0.05$ in the rate of anxiety between study and control group in the initial visit. The initial preparation of the student by psychological priming reduces the stress levels, so that the study group experienced less emotional effects during dissection when compared to the control group in relation to exposure to cadavers.

Key Words: cadaver dissection, emotional impact, medical students

The anatomy dissection hall represents a significant emotional challenge to many medical students, in that it may be the student's first intimate experience with illness and even death. Further, the anatomy dissection hall may be compared to subsequent clinical encounters because it asks that the student concentration and data collection and simultaneously deal with disturbing thoughts and feelings. Those involved in anatomy instruction are in an unique position to help impart desirable values to young physicians as they adjust to the stresses (Turney, 2007). Contact with the cadaver can be highly stressful for some students. It becomes a necessity to prime them emotionally and prepare them to face the cadaver and this holds particularly true to the students expressing negative emotions. Human dissection provides a unique opportunity for sensitizing the medical students to many complex issues that they will encounter in their career. The dissection of cadaver allows the discussion of difficult topics such as human digestion, mortality, grief and methods to deal with the emotions (Lempp, 2005).

Anatomical dissection is a time honored part of medical education.It plays an important role in shaping the medical students attitudes to life and death.Traditionally, learning anatomy has been dissection-based. Dissection has become synonymous with traditional courses

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IJAS 2011, 2(2): 26-30

and has come to be regarded as the antithesis of problem-based learning (PBL). Students have a high regard for dissection as a learning resource in the anatomy course. Dissection allows appreciation of 3-D Anatomy based on the sense of touch unlike any other teaching facility (Arraez, 2008).

Historically, anatomy has been taught predominantly in the first undergraduate year. Dissection of the cadaver is part and parcel of the first year curriculum in medical colleges and it has an important role to play in undergraduate medical education. Entering for the first time into the Anatomy dissection hall and facing the cadaver for the first time represents a significant emotional challenge to many first year medical students. There are many virtual models of dissection getting developed by the use of computers, but till date the physical process of handling dissection of the cadaver holds the perfect way to learn human anatomy, with knowledge to appreciate the organization of the human body.

The evoked emotions, often suppressed with varied success are heightened by the fear and uneasiness each person experiences when dissecting the body of a human being, the emotions can interfere with the educational task (Chatlton, 1994).

Moreover anatomists are often the first teachers in the curriculum who need to be aware of ethical problems. More attention should be paid to the first encounter with the cadaver and students should be offered the opportunity to discuss their emotions (Mc Garvey, 2001). Therefore in order to assess the impact of anxiety and physical symptoms from the experience of dissection room, questionnaires were prepared to analyze whether emotional stress can be diminished and to observe changes regarding feeling and attitude in control and study groups.

The aim of the present study was to evaluate the emotional impact of cadaver dissection in the first year medical students and to identify the curricular design to alleviate the level of anxiety in them by psychologically priming the students before they enter the dissection hall.

Materials and Methods

An experimental study was conducted among 140 first year medical students of a private medical college in Chennai after obtaining their informed consent. The questionnaires were administered at two instances. The first questionnaire was given to each student before visiting the dissecting room for the first time which comprised questions relating to demographic information of the respondents, previous exposure to dead bodies and varying degree of fear or stress responses. The Students were randomly divided into two groups, Group A the counseled (n=70) and Group B the un counseled (n=70) groups.

The group A was psychologically primed by a clinical psychologist during an interactive lecture for coping with dissection and students were provided with the necessary information regarding the source of cadaver and the processing of fixation, legal arrangements including the reception , disposal and burial of cadaver. The advantages of using dissection for better appreciation of the three dimensional view of the human body and understanding of normal variations was explained to the counseled group. However the students in group B had no much preparation by a clinical psychologist. After the first exposure to cadaver both groups were surveyed by the second questionnaire (Table I) which measures the cognitive,physiological and motor symptoms like nausea, dizziness, weakness and restlessness and cognitive symptoms such as lack of concentration, and symptoms of anxiety.

Observations

Out of the 150 students, 140 had volunteered to participate and completed the questionnaires while 10 students abstained

from the study. The age of the students ranged from 18 – 22 years. In both the groups males were more than females (Table II). Although more number 26(38%) of group B students have seen a cadaver before the first exposure to the dissection hall, the level of fear or stress with regards to the cadaver is almost the same in both the groups (Table III). However more number of students, 40(58%) in the group A felt happy to enter the dissection hall than the group B 28(40%). The feeling of unpleasantness is more in the group B students 17(25%) compared to the group A students 15(22%). There was a significant difference $p<0.05$ in the rate of anxiety experienced by the students between the two groups in the initial visit to the dissection hall. (Table IV).

Table 1 Questionnaire to measure the level of physical symptoms suffered by students in dissection hall

Encircle the number that reflects the severity of your symptoms

0 to 3 (Likert scale); 0 = No symptoms; 1 = Mild; 2 = Moderate; 3 = severe

Symptom	**Likert Scale grade**			
Nausea	0	1	2	3
Dizziness	0	1	2	3
Weakness	0	1	2	3
Fear	0	1	2	3
Restlessness	0	1	2	3
Sweating	0	1	2	3
Difficulty in Breathing	0	1	2	3
Tremors	0	1	2	3

Table 2 Demographic Variable of the Study Population

	Age	Counseled Group A	Un counseled Group B
Age	18 – 22	70	70
Sex	Male	54 (77%)	49 (70%)
	Female	16 (23%)	21 (30%)

Table 3 Results for the questionnaire filled prior to entering the dissection hall

Question		Counseled group	Un Counseled group
Q 1. Have you ever seen a cadaver before?	Yes No	22(32%) 48(68%)	26(38%) 44(62%)
Q 2. Have you ever had any fear or stress till now, with regard to the cadaver?	Yes No	64((91%) 6(9%)	65(92%) 5(8%)
Q 3. How do you feel, now that you need to enter the dissection room for the first time?	Happy Unhappy No Feeling	40(58%) 15(22%) 14(20%)	28(40%) 17(25%) 25(35%)

Table 4 Results of the level of Physical Symptoms suffered by students in Dissection Hall

0 to 3 (Likert scale); 0 = No symptoms; 1 = Mild; 2 = Moderate; 3 = severe

Symptom	*Group – A (Counseled)*		*Group – B (Un counseled)*	
	Number	*Percentage*	*Number*	*Percentage*
Nausea	*18*	*26%*	*25*	*36%*
Dizziness	*2*	*3%*	*10*	*15%*
Weakness	*18*	*26%*	*17*	*25%*
Fear	*21*	*30%*	*26*	*38%*
Restlessness	*13*	*18%*	*15*	*22%*
Lack of Concentration	*22*	*32%*	*29*	*41%*

Discussion

Stressful reactions are observed in the first year medical students who face a cadaver for the first time in the dissecting room. Students learn rapidly to develop a coping mechanism that enables them to depersonalize cadaver dissection (Aletta et al, 2004).

Even as more number (26) of group B students have already seen a cadaver before (38%) when compared to the group A students 22 (32%),an unhappy emotional state was observable in more number of group B students 17 (25%) when compared to the group A students 15 (22%). Similar results were observed by Izunya *et al* (2010) in Nigeria,which showed that 59% of un counseled students found their first visit exciting,while 57% suffered every little or no stress at all.In an another study 53% un counseled students expressed emotional shock at initial exposure,while 44% un counseled did not show any emotional shock.35% experienced anxiety and stress whereas 57% did not show any anxiety and stress immediately before and during dissection.These phenomena have been widely reported as several studies suggest that some students suffer stress reactions, which significantly impair their learning of anatomy (Horne et al., 1990; Finkelstein and Mathers,1990; Evans and Fitzgibbon,1992),Moreover, a happy emotional state was present in 40 (58%) of the group A students when compared to very little of 28 (40%) in the group B students.

Considering the cognitive, physiological and motor symptoms we were able to observe that more number of group B students developed nausea 25 (36%) when compared to the group A students 18 (26%).Similarly more number of group B students 10 (15%) developed dizziness compared to group A students 2 (3%). A similar pattern of results with more symptoms of fear 26 (38%), restless 15 (22%), lack of concentration 29 (41%) were notable in the group B compared to group A 21 (30%), 13 (18%), 22 (32%) respectively. Regarding apprehension towards initial exposure to cadaver, Izunya et al (2010) observed that one-third (35%) of the un counseled students expressed apprehension to handle cadaver directly, while 46% did not. Rajkumari et al. (2008) also, reported that about one-third (32.5%) of the un counseled students expressed apprehension to handle cadaver directly, whereas 53.75% did not.

Some authors (O'Carroll *et al.,* 2002; Vijayabhaskar *et al*., 2005, McGarvey *et al*., 2001) have demonstrated that first year pre-clinical students do not report their first exposure to cadaver dissection as an aversive experience. Instead, they found it to be a positive, significant and challenging life event. Rajkumari *et al*.,(2008) reported that Most of the first year medical students found their first visit to the anatomy dissection room exciting and suffered very little or no stress at all on their first visit.

To acquire better educational results, mental preparation was applied for the group A of medical students. The results to the questionnaires demonstrated that psychological priming prepare mentally and emotionally before entering dissection theatre so that working in the dissection hall. The mental preparation is a useful method for reducing anxiety. This finding supports that psychological priming helps to gain better advantage of dissection. The students need to prepare mentally and emotionally before entering dissection theatre, so that they are emotionally involved and stimulated.

Conclusion

Organizing an orientation program by a clinical psychologist along with an anatomist and small group discussions with faculty members would encourage expression of reactions and emotions by the students at the entry level to the first year

medical profession. There is a need for improving both the preparation for coping with dissection and the follow - up opportunities for dealing with professional and ethical issues raised during human dissection. Working with cadavers can create a strongly negative experience is some students and it warrants special curricular attention.

Despite curriculum changes, the undergraduate medical student's first encounter with a human corpse will still be in anatomy. Considering the fact that there is an association between severe psychological stress and post—traumatic stress disorder, the results of this study suggest a need for improving both the preparation for coping with dissection and the follow-up opportunities for dealing with professional and emotional issues raised during human dissection.

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Case Report

Incomplete Horizontal Fissure of Right Lung - A Case Report

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Abstract: The right lung has two fissures, an oblique and a horizontal, dividing it into three lobes namely the upper, middle and lower. The anomaly of the fissure pattern has been described by many radiologist, whereas, there were only fewer studies on gross anatomical specimens. The present case describes a peculiar incomplete horizontal fissure which started from the oblique fissure but did not traversed backwards towards the medial surface of the lung. Anatomical knowledge of anomalies of fissures and lobes of lungs is important for surgeons performing lobectomies, radiologists interpreting X-ray and CT scans and also of academic interest to all medical personnel.

Key words: anatomical variation, abnormal lung fissure

The right lung normally has three lobes namely the upper, middle and lower formed by two fissures; an oblique and a horizontal one (Standring, 2005). The oblique fissure runs downwards, thereby meeting the inferior border of the lung at a distance of approximately 7.5 cm behind anterior end (Standring 2005). The horizontal fissure passes from the oblique fissure at the level of midaxillary line to the anterior border of the lung at the level of sternal end of fourth costal cartilage (Standring 2005). In the present case we report an incomplete horizontal fissure in the right lung specimen for its rarity and academic interest.

Case Report

During routine dissection training for postgraduate students, in a 55 year old female cadaver, we encountered an anomalous right lung, which displayed incomplete horizontal fissure. The pulmonary fissures and lobes were studied and appropriate measurements were taken. The specimen was photographed.

The right lung displayed an oblique fissure, which originated at a distance of 7cm from the apex on the vertebral part of medial surface and after traversing a distance of 8 cm, it continued downwards as the conventional oblique fissure to cross the inferior border at a distance of 2 cm. Thus the oblique fissure was as per standard descriptions. Although the horizontal fissure was seen as per typical description i.e. it runs from oblique fissure 10 cm from the anterior border, it did not traverse backwards towards the medial surface of the lung. Thus, instead of traversing the entire lung, the horizontal fissure seen in this specimen did not divide the lung completely into a middle lobe. As a consequence to such anomalous incomplete horizontal fissure, the right lung was found to possess a completely divided lower lobe with upper and middle lobes incompletely separated from each other. No abnormality was detected in the left lung.

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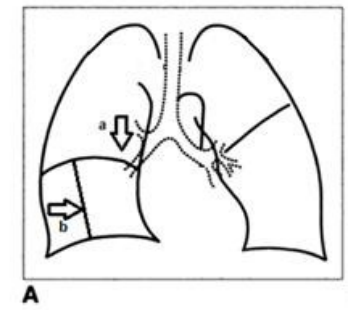
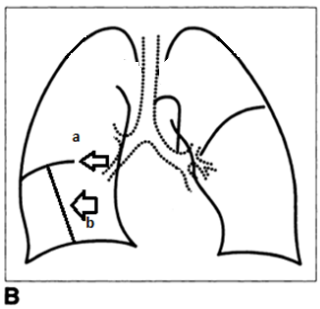
Fig. 1 Photograph showing the right lung seen with an incomplete horizontal fissure

Fig. 2 Diagrammatic representation of fissure pattern of normal right lung and the anomalous one reported



A

A) Normal right lung displaying
(a) Horizontal fissure and
(b) Oblique fissure



B

B) Anomolous lung displaying
(a)Incomplete horizontal fissure and
(b)Normal oblique fissure

Discussion

Lung develops from numerous bronchopulmonary buds which fuse completely in the later part of development except at sites of fissure formation, resulting in the formation of lobes and fissures (Frija *et al*., 1988). Any deviation from the normal pathway of fusion of bronchopulmonary buds results in the formation of variations involving lobes and fissures of the lungs (Sadler, 2004). The fissures are the spaces which separate individual bronchopulmonary buds or segments and they get obliterated except along the two planes which later manifests as horizontal or oblique fissure Non-obliteration of these spaces gives rise to accessory fissures of the lung (Meenakshi, 2004).

An incomplete fissure may be of varying depth occurring between broncopulmonary segments and is also a cause for post operative air leakage (Walker, 1997). Often accessory fissures act as barriers to infection spread, creating a sharply marinated pneumonia which can wrongly be interpreted as atelectasis or consolidation (Godwin and Tarver, 1984). The knowledge of anatomy of fissures of lung may help clarifying initially confusing radiographic findings like extension of fluid into an incomplete major fissure or spread of various diseases through different pathways (Dandy, 1978) and explain radiological appearances of interlobar fluid (Raasch, 1982). Accurate recognition of lung anomalies in different populations will improve the understanding of lesions like pneumonia, pleural effusion, and collateral air drift along with disease spreading through the lung.

Aldur *et al*., (1997) concluded that a surgeon must always remember the anatomical variations of the location of the lungs especially in lobectomies and in segmental resection. Hayashi *et al*., (2001) concluded that anatomy of normal variants of the major fissures is essential for recognizing their variable imaging appearances and related abnormalities.

The presence of fissures in the normal lungs enhances uniform expansion

and hence facilitates more air intake. Accessory and incomplete fissures of varying depth can be seen in unusual locations of the lung, delimiting abnormal lobes which corresponding to the normal bronchopulmonary segments especially in infants. From a radiological point of view, an accessory or anomalous fissure is important as it can be mistaken for a lung lesion or an atypical appearance of pleural effusion.

Considering the clinical and surgical importance of such variations, from anatomical point of view, one can opine that prior anatomical knowledge and high index of suspicion for probable variations in the fissures, lobes and bronchopulmonary segments in the lung may be important for clinicians, surgeons and radiologists.

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Case Report

Cystic Duct Remnant Syndrome Associated with Symptomatic Dilatation of Cyst Duct

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Abstract: A case of recurrent abdominal (biliary tract) symptoms, mimicking gallbladder disease after previous cholecystectomy is presented. The symptoms were attributable to a long residual cystic duct stump with low insertion which was missed at previous surgery. The residual stump had undergone dilatation mimicking a gallbladder. Awareness of anomalies and variations of the extra hepatic biliary tree is necessary to avoid such unforeseen complications.

Key words: residual cystic duct stump, anatomical variations, post cholecystectomy syndrome, cystic duct remnant syndrome.

Variations in cystic duct anatomy are not uncommon and reported incidences vary from 18% -23%. There may be variable length of cystic duct, variable course, and variable insertion. The cystic duct joins the common bile duct in its distal part in 9-11% (Taourel *et al.*, 1996; Turner and Fulcher, 2001; Tsitouridis *et al.*, 2007). Failure to recognize these variations may lead to ductal ligation, biliary leaks or strictures after laparoscopic cholecystectomy (Suhocki and Meyers, 1999; Marcos, 2000). Any failure to recognize these variations may lead to ductal ligation, biliary leaks or strictures after laparoscopic cholecystectomy (Suhocki and Meyers, 1999; Marcos, 2000). Of the anomalies one of the most significant is a low insertion of the cystic duct with the long cystic duct running parallel to or behind the common bile duct. This anomaly is difficult to recognize on the table unless the surgeon is aware of this variation because 'what your mind does not know your eyes can not see'.

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Case Report

A 57 years old male, presented with history of pain in the right upper quadrant of the abdomen with nausea and occasional vomiting. There was no history of fever or obstructive jaundice. Past history revealed that he had undergone a laparoscopic cholecystectomy ten years earlier. Surgery and immediate postoperative period were uneventful. He developed recurrent abdominal pain and jaundice a year after surgery. Endoscopic retrograde cholangiopancreatography (ERCP) showed a residual Common Bile Duct (CBD) stone which was extracted after sphincterotomy. A temporary stent was inserted for two months with complete relief.

In the current presentation there were no abdominal findings. Routine hematological and urinary examinations were normal. Ultrasound showed absent gall bladder with no other positive findings. Since symptoms were suggestive of recurrent biliary disease, a Magnetic Resonance Cholangiopancreatography

IJAS 2011, 2(2): 34-36

(MRCP) was advised. This showed a long cystic duct remnant, low insertion of the cystic duct and dilatation of the residual cystic duct mimicking a 'neo-gall bladder' (Cystic duct remnant syndrome). He was put on cholagogues and advised regular follow up.

Fig. 1 MRCP showing dilatation of stump of cystic duct into a fusiform dilatation – 'neo gall bladder'

Discussion

The cystic duct is subject to several anatomical developmental/congenital variations such as i) the cystic duct and common hepatic duct running parallel with a low confluence of cystic duct (Lamah *et al.*, 2001) ii) insertion of the cystic duct in the right or left hepatic duct and bifurcation of left and right hepatic ducts (Lamah *et al.*, 2001) iii) anterior, posterior or spiral types of insertion of the cystic duct iv) absence or short cystic duct (less than 5mm) v) double cystic duct (Fujikawa *et al.*, 1998; Bernard *et al.*, 2001) vi) the right hepatic duct emptying into the cystic duct (Hashimoto *et al.*, 2002) vii) hepatico-cystic duct (Loasnoff *et al*., 2002).

Developmentally, it is from the *pars cystica* of hepatic bud arises both gall bladder and cystic duct. The bile duct arises also from hepatic bud proximal part to *pars cystica*. During development bile duct opens first on ventral aspect of duodenum, when rotation of duodenal loop occurs, bile duct opens on the dorsomedial aspect of duodenum (Singh and Pal, 2007). Developmental anomalies such as Sessile Gall Bladder – direct opening of gall bladder into bile duct, agenesis – absence of gall bladder and diverticulum from any part of the gall bladder has been documented (Singh and Pal, 2007).

Anatomical variations regarding the duct system have also been documented previously (Singh and Pal, 2007). This includes termination cystic duct on the left side of common hepatic duct, termination of cystic duct into right hepatic duct, opening into common hepatic duct after passing anterior to the duodenum, opening of bile duct into either pyloric part or cardiac part or at end of stomach, partial or complete atresia of duct system, duplication of parts of duct system etc. Knowledge about the possible anatomical variations is of importance for successful treatment.

Various authors have studied and reported on complications due to cystic duct variations. The left out cystic duct stump have frequently caused complications of cholecystectomy. Rogy *et al.,* (1991) has reported post operative complication following cholecystectomy in 10% which was due to remnant of cystic duct. Walsh *et al.*, (2002) has reported that remnant of cystic was the cause of relapse or recurrence of symptoms after cholecystectomy. It is preventable by identifying junction of cystic duct with CBD per operatively (Walsh *et al.*, 2002). Tantia *et al.*, (2008) also has reported left out cystic duct causes problems. Wani *et al.*, (2010) has labeled this condition as post cholecystectomy Mirrizzi Syndrome.

MRCP and ERCP remain the definitive methods of assessing cystic duct anatomy. Of the two, MRCP is less invasive. Shaw *et al.*, (2004) has considered that MRCP is the best method of diagnosis of cystic duct remnants.

Observations of the present study also support those previous reports. Low insertion of cystic duct in the present case might have evaded surgeon's attention during surgery which had resulted in the remnant duct. With dilation of the remnant duct a "neo-gall bladder" was formed which had resulted in the relapse of symptoms. As concluded by Shaw *et al.*, (2004) MRCP was most useful and helped to diagnose the left out remnant duct after cholecytectomy in the present case. By presenting this interesting case about left out cystic duct after cholecytectomy and its involvement in post-operative complications, importance of knowledge about anatomy of extra-hepatic biliary apparatus is emphasized.

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Contents