Sudan university of sciences and technology

College of graduate studies

AStudy of Female Pelvis Malignancy Using Computed Tomography

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دراسة أورام الحوض لدى النساء بإستخدام الاشعة المقطعية

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Thesis submitted for a partial fulfillment of award of master degree in diagnostic radiological technology

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بسم الله الرحمن الرحيم

صدق الله العظيم

DEDICATION

This research is dedicated to the memory of my mother

To my father

To my husband

To my Noor

Thank you for your love and support.

Acknowledgement

<u>ABSTRACT</u>

This study aimed to evaluate the accuracy of CT scan in diagnosing pelvic malignancy. Female pelvic malignancy is one of the main leading causes of death among female. Early and accurate diagnosis is mandatory to obtain a good outcome. During the last years, usage of CT in evaluating pelvic malignancies increased dramatically

The study done in RICK center in the period between march 2016 to september 2016. Study population was any female Patients underwent CT abdomen & pelvis for evaluation of pelvic mass and underwent laprotomy with histopathological examination that confirm pelvic malignancy(Ca ovary, Ca endometrium, Ca cervix, Ca urinary bladder, &Ca rectum). Study sample was 70 patients. The data was collected through interviewer filled questionnaire. Data was managed by using the computer data base management and analysis was performed by using the statistical package for social science (SPSS); version 19.

The result showed**,** The overall accuracy of CT in diagnosing pelvic malignancy was 85.7%. Out of total 70 cases of gynecological cancers) diagnosed,(44%) were ovarian,(27.1%) cervical, (13%) endometrial, (12.9%) rectal, &(2.9%) Ca urinary bladder. Mixed adenexial tumors made(32.9%) of Ca ovary cases, (66.7%)of patients with Ca endometrium presented with mass lesion, (84%)of patients of Ca cervix presented with a mass in the CT,(87.1%) cases of Ca urinary bladder were diagnosed as normal, &(66.7%) cases with Ca rectum presented with abnormal wall thickening. Squamous cell carcinoma was the commonest histologic type in cervical & urinary bladder cancers, whereas adenocarcinoma was the commonest histological type in the endometrial, ovarian & rectal cancers. Gynecological cancers were most common in age above 40 years (84.3%).

Normal bony pelvis and pelvic lymph nodes were found in the majority of cases. Omental was the commonest mode of distant metastasis, present in (55%) of patients.

Accuracy of CT in diagnosing pelvic masses was differ according to the type of malignancy, being accurate in diagnosing ovarian and cervical, and of low accuracy in diagnosing rectal & urinary bladder cancers.

Frequency of pelvic masses increases with age. The commonest type of pelvic malignancy was Ca ovary.

ملخص الدراسة

الهدف من هزه الدراسة هو معرفة دقة الأشعة المقطعية في تشخيص سرطان الحوض استنادا إلى نتيجة تشريح النسيج المرضي

تمت الدراسة في مستشفى الزرة للعلاج بالأشعة في مدينه الخرطوم لجميع المرضى من النساء اللاتي خضعن للتقييم الشامل للحوض بالأشعة المقطعية وخضعن لعملية فحص الأنسجة التي تؤكد صحة تشخيص سرطان الحوض في الفترة ما بين مارس 2016 الي سبتمبر 2016

70مريضة مصابة بسرطان الحوض قدمت الى مستشفى الزرة للعلاج بالأشعة وتم العثور على التوزيع العمري لهن(15.7%) مريضة دون سن 40،و(84.3%) مريضة فوق سن 40

تم إجراء تشخيص دقيق من قبل الأشعة المقطعية استنادا الى نتيجة تشريح النسيج المرضي في 85.7%من المرضى ، ولم يكن دقيقا في 14.3% من المرضى .
وكان أكثر الأورام الخبيثة شيوعا سرطان المبيض 44%،ثم سرطان عنق الرحم 27.1، سرطان الرحم 13%،سرطان المستقيم 12.9 وكان أقلها شيوعا سرطان المثانة البولية 2.9%.

كانت دقة الأشعة المقطعية في تشخيص سرطان الحوض 85%. التشخيص بحالات سرطان الحوض يزيد مع التقدم في السن وكان أكثر الأورام شيوعا سرطان المبيض ، يليها سرطان عنق الرحم وسرطان الرحم ،سرطان المستقيم ثم سرطان المثانة البولية.

ينصح بإجراء المزيد من البحوث للمقارنة بين دقة التشخيص بالموجات فوق الصوتية والتصوير المقطعي للحوض ، وزلك لأن نسبة كبيرة من الحالات التي عرضت على مستشفى الزرة للعلاج بالأشعة قيمت فقط بالموجات فوق الصوتية .
وينبغي تشجيع أبحاث أخرى لتحديد أسباب الحالات التي تم تشخيصها خطأ.

LIST OF ABBREVIATIONS

Ca   : Carcinoma

UB   :   Urinary bladder

CX   :   Cervix

RICK   :   Radiation and isotope center Khartoum

CT   :   Computed tomography

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Chapter One

Introduction

1.1 Introduction:

Female pelvic masses most commonly arise from the reproductive tract, although masses may arise from m other structures in the pelvis, such as the gastrointestinal or urinary tracts. The evaluation of a pelvic mass often begins with the physical exam and proceeds to ultrasound, computed tomography, or magnetic resonance imaging. Each of these modalities has a role in the work-up of pelvic masses and each modality has inherent advantages and disadvantages.(Patel, Ghanekar,et al 1997) The differential diagnosis for pelvic masses is extremely broad. Clinical history, precise anatomical localization, and CT imaging characterization can significantly narrow the differential diagnosis. (Robboy SJ, et al,1994)

A wide spectrum of benign extraovarian pathology may closely resemble ovarian cancer. Fallopian tube disease such as hydro salpinx, tub ovarian abscess, and chronic ectopic pregnancy may mimic cystic or solid ovarian neoplasm. Pedunculated uterine leiomyomas may imitate ovarian lesions. Gastrointestinal causes of adnexal masses include mucocele, abscess, and hematoma. These entities may appear similar to ovarian lesions, thus requiring close attention to specific anatomical detail in order to help differentiate them. Similarly, peritoneal disease including tuberculous peritonitis and peritoneal pseudocyst may simulate ovarian tumor. Ultrasound represents the initial and crucial imaging modality in the evaluation of pelvic disease, but CT capability and improved tissue characterization make it a valuable modality in many circumstances. Our observation is that, many cases of pelvic masses were evaluated by CT, and this observation raised the question:

Is CT accurate in diagnosing pelvic masses? The accuracy of CT in diagnosing pelvic malignancy in female was tested by comparing the result of preoperative CT imaging with the postoperative histopathological results.

And this is the core aim of our research.

1.2 Problem statement:

Is the CT accurate in diagnosing pelvic malignancy in female? Justification: Clinical parameters, including age and clinical history are the crucial step in starting diagnosis of patients with pelvic malignancy. Then, the treating doctor will do the physical examination and proceed to investigate the patient by doing abdominal ultrasound. The second step will include imaging the patient with abdominal CT. Specific CT imaging findings will detect or raise the suspicion of malignancy; the strength of these findings is out of the scoop of this study. The next step will be obtaining a tissue sample for histopathology which will confirm or exclude malignant cells. Because of that, this research is conducted to evaluate how CT abdomen is accurate in guiding the treating doctor in managing this group of patients.

1.3 Objective:

1.3.1 General objectives:

  The objective of this study is to evaluate the diagnostic value and accuracy of CT scan in pelvic malignancy based on the result of histopathology of patients undergoing laparotomic surgery.

1.3.2 Specific objectives:

- To determine the percentage of CT results that matches the histopathological result.

- To identify the common histopathological types of pelvic malignancy in Sudanese females.

Chapter two

Literature review

2.1 Literature review :

Development of the female urogenital system and rectum: The embryology of the female genital tract is relevant to the histogenesis of various tumors.

The primordial germ cells arise in the wall of the yolk sac by the fourth week of gestation, and then by the fifth or sixth week, they migrate into the urogenital ridge. The mesodermal epithelium of the urogenital ridge then proliferates, eventually to produce the epithelium and stroma of the gonad.

The dividing germ cells of endodermal origin are incorporated into these proliferating epithelial cells to form the ovary. A second component of female genital development is the mallerian duct. At about the sixth week, invagination and subsequent fusion of the coelomic lining epithelium form the lateral miillerian (or paramesonephric) ducts. Mallerian ducts grow caudally to enter the pelvis, where they swing medially to fuse with the urogenital sinus at the miillerian tubercle. Further caudal growth brings these fused ducts into contact with the urogenital sinus, formed when the cloaca is subdivided by the urorectal septum. Normally, the unfused portions mature into the fallopian tubes, the fused caudal portion developing into the uterus and upper vagina and the urogenital sinus forming the lower vagina and vestibule.

Consequently, the entire lining of the uterus and tubes as well as the ovarian surface is ultimately derived from coelomic epithelium (mesothelium). The epithelium of the vagina, cervix, and urinary tract is formed by induction of basal cells from the underlying stroma, which undergo squamous and urothelial differentiation.

A portion of these cells remains uncommitted, forming the reserve cells of the cervix. The latter are capable of both squamous and columnar cel differentiation.

The Urinary Bladder is formed partly from the endodermal cloaca and partly from the ends of the Wolffian ducts. After the separation of the rectum from the dorsal part of the cloaca; the ventral part becomes subdivided into three portions: an anterior vesico-urethral portion, continuous with the allantois into this portion the Wolffian ducts open, an intermediate narrow channel, the pelvic portion; and a posterior phallic portion, closed externally by the urogenital membrane. The second and third parts together constitute the urogenital sinus. The vesico-urethral portion absorbs the ends of the Wolffian ducts and the associated ends of the renal diverticula, and these give rise to the trigone of the bladder. The remainder of the vesico-urethral portion forms the body of the bladder, its apex is prolonged to the umbilicus as a narrow canal, which later is obliterated and becomes the medial umbilical ligament (urachus).

2.2 Anatomy of the female pelvic organs:

2.2.1 Ovaries:

The ovaries are two nodular bodies, situated one on either side of the uterus in relation to the lateral wall of the pelvis, and attached to the back of the broad ligament of the uterus, behind and below the uterine tubes (figure 2.1). The ovaries are of a grayish-pink color, and present a puckered uneven surface. They are about (4 x 2.5 x 1.5) cm for each, and weigh from 2 to 3.5 gm during active reproductive life. They lie in a shallow depression, named the ovarian fossa, on the lateral wall of the pelvis; this fossa is bounded above by the external iliac vessels, in front by the obliterated umbilical artery, and behind by the ureter. The ovary becomes displaced during the first pregnancy, and probably never again returns to its original position. In the erect posture the long axis of the ovary is vertical. The lateral surface is in contact with the parietal peritoneum, the medial surface is to a large extent covered by the fimbriated extremity of the uterine tube. The mesovarian border is straight and is directed toward the obliterated umbilical

artery, and is attached to the back of the broad ligament by a short fold, this fold the blood vessels and nerves pass to reach the hilum of the ovary.

2.2.2 Uterus:

The uterus is a hollow, thick-walled, muscular organ situated deeply in the pelvic cavity between the bladder and rectum. Into its upper part the uterine tubes open, one on either side, while below, its cavity communicates with that of the vagina. The uterus varies in size depending on the age and parity of the individual. It weighs about 50 gm and measures about (8.0 x 6.0 x 3.0) cm in nulliparous reproductive age women. This is due to the uterus undergoing changes in size and structure to accommodate itself to the needs of the growing embryo. After parturition the uterus returns almost to its former condition, but certain traces of its enlargement remains & measuring about 70 gm. Then following menopause, it diminishes to half its weight and dimension. (figure 2.2) It is necessary, therefore, to describe as the type-form the adult virgin uterus, and then to consider the modifications which are affected as a result of pregnancy.

2.2.3 Urinary bladder:

It is a musculo-membranous sac which acts as a reservoir for the urine./ Its size, position, and relations vary according to the amount of fluid it contains, in both conditions the position of the bladder varies with the condition of the rectum, being pushed upward and forward when the rectum is distended.

When the bladder is moderately full it assumes an oval form; the long diameter of the oval measures about 12 cm, and is directed upward and forward.

In thiscondition it presents a postero-suarior, an antero-inferior, and two lateral surfaces. The postero-superior surface is covered by peritoneum: behind, it is separated from the rectum by the rectovesical excavation, while its anterior part is in contact with the coils of the small intestine. The antero-inferior surface is devoid of peritoneum, and rests, below, against the pubic bones, above which it is in contact with the back of the anterior abdominal wall. The lower parts of the lateral surfaces are in contact with the lateral walls of the pelvis. The line of peritoneal reflection from the lateral surface is raised to the level of the obliterated hypogastric artery.

2.2.4 Rectum:

The rectum is the lower part of the colon that connects the large bowel to the anus, begins at the rectosigmoid junction, at the sacral promontory. The rectum's primary function is to store formed stool in preparation for evacuation. The 3 layers of the rectal wall are as follows: Mucosa: a layer of the rectal wall lines the inner surface. The mucosa is composed of glands that secrete mucus to help the passage of stool. Muscularispropria: The middle layer of the rectal wall is composed of muscles that help the rectum keep its shape and contract in a coordinated fashion to expel stool. Mesorectum: a fatty tissue surrounds the rectum. It is about 12 cm long, its caliber is similar to that of the sigmoid colon at its commencement, but it is dilated near its termination, forming the rectal ampulla. It terminates at the level of the anorectal ring, the dentate line.

2.2.1 BLOOD SUPPLY & VENOUS RETURN:

2.2.1.1 Ovary: Ovary is supplied by the ovarian artery & uterine artery. Venous drainage through pampiniform venous plexus, which on the right side drain into IVC & In the left side drains into left renal vein. (Uterus: It is supplied by the uterine artery & ovarian artery.
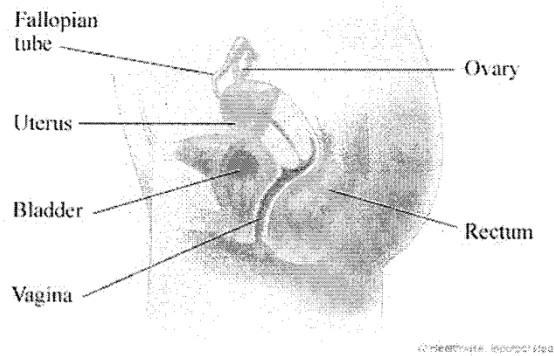
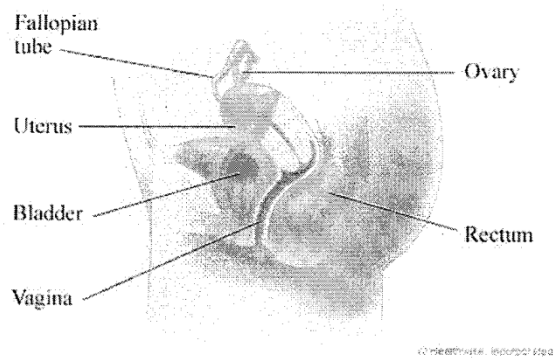Figure (1.1): sagittal section through a female pelvis

figure (1.2): coronal section through a female genital tract.

Venous drainage is through veins form a plexus which drain through uterine ovarian and vaginal veins into internal iliac veins.

2.2.1.2 Urinary bladder:

They are the superior, middle, and inferior vesical, derived from the anterior trunk of the hypogastric. The obturator and inferior gluteal arteries also supply small visceral branches to the bladder, and additional branches are derived from the uterine and vaginal arteries. The veins form a complicated plexus on the inferior surface, and end in the hypogastric veins. Rectum: It is supplied by the superior rectal artery (the continuation of the inferior mesenteric artery), the middle and inferior rectal arteries, and by the median sacral artery. The submucosal venous plexus above the pectinate line drains into the superior rectal

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veins (portal system). The venous plexus below the pectinate line drains to the inferior rectal vein which joins the internal pedundal artery (the systemic system).

2.2.2 LYMPHATIC DRAINAGE:

2.2.2.1 Ovary:

The main lymphatic drainage of the ovaries is- along vessels that follow the ovarian veins to para-aortic nodes situated near the origin of the renal arteries. Drainage may also occur via pelvic nodes into lower para-aortic nodes, and rarely may follow the round ligament to the inguinal nodes.

2.2.2.2 Uterus:

Majority of the vessels of the body and fundus of the uterus pass lateral ward in the broad ligaments, and are continued up with the ovarian vessels to the lateral and pre-aortic glands; a few, however, run to the external iliac glands, and one o two to the superficial inguinal glands.

2.2.2.3 Cervix:

The lymphatic vessels of the cervix run in three directions: transversely to the external iliac glands, postero-laterally to the hypogastric glands, and posteriorly to the common iliac glands.

Urinary bladder: Initial lymphatic drainage from the bladder is primarily into the external iliac, obturator, internal iliac (hypogastric), and common iliac nodes.

2.2.2.4 Rectum:

The lymphatic vessels of the upper half of the rectum ascend with the superior rectal blood vessels to reach the pararectal nodes and pass into the inferior mesenteric nodes. The lymphatic vessels of the lower half of the rectum up to the upper half of the anus travel via the middle rectal blood vessels to reach the internal iliac nodes. Others pierce the levatorani and accompany the internal pudendal and inferior rectal blood vessels to reach the internal iliac nodes.

2.2.3 INNERVATION:

2.2.3.1 Ovary:

The ovarian innervation is derived from autonomic plexuses. The upper part of the ovarian plexus is formed from branches of the renal and aortic plexuses, and the lower part is reinforced from the superior and inferior hypogastric plexuses.

2.2.3.2 Uterus & Cervix:

They are innervated from the uterovaginal plexus. As a subdivision of the inferior hypogastric (pelvic) plexus, sympathetic, parasympathetic, and visceral afferents to and from the uterus pass through this plexus.

2.2.3.3Urinary bladder:

Autonomic supply is by hypogastric nerve. Somatic supply is by the pudendal nerve.

2.2.3.4 Rectum:

Parasympathetic innervations are the main motor fibers to muscles of the rectal wall. From the pelvic splanchnic nerves (S2—S4) via the inferior hypogastric plexus to middle rectal plexus & Visceral afferent (sensory) fibers travel via the inferior hypogastric plexus and pelvic splanchnics back to spinal cord.

2.3 PATHOLOGY:

2.3.1 Ovarian cancer:

Ovarian cancer is a common gynecological cancer. It caused nearly 14,000 deaths in the United States alone in 2010. It has a poorer outcome with a 5 years survival rate equal 47%. This is due to lack of any clear early detection or screening test, and most cases are not diagnosed until they have reached advanced stages. This is because symptoms are frequently very subtle early, and are easily confused with other illnesses. More than 75% of women presenting with this cancer have stage III or stage IV cancer, when it has already spread beyond the ovaries, on other abdominal (peritoneal) structures, included the uterus, urinary bladder, bowel and the omentum forming new tumor growths before cancer is even

suspect. In most cases, the exact cause of ovarian cancer remains unknown. The risk of developing ovarian cancer appears to be affected by several factors. Older women, and in those who have a first or second degree relative with the disease, have an increased risk.

Infertile women, those with endometriosis, and those who use postmenopausal estrogen replacement therapy are also at increased risk.

Hereditary forms of ovarian cancer can be caused by mutations in specific gens (BRCA1 and BRCA2, and in genes for hereditary nonpolyposis colorectal cancer

Protective factors include combined oral contraceptive pills, early age at first pregnancy, older age of final pregnancy and the use of low dose hormonal contraceptive, women who have had tubal ligation, and breastfeeding also lower the risk developing ovarian cancer. Ovarian cancer is classified according to the histology which dictates many aspects of clinical treatment, management, and prognosis. In a retrospective analysis performed in histopathologically proven gynecological malignancies

done in Nepal, most of ovarian cancers are classified as epithelial. Other types may arise from the egg cells (germ cell tumor) or supporting cells. Ovarian epithelial carcinoma includes:

- Serous cystadenocarcinoma

- Endometrioid tumor

- Mucinous cystadenocarcinomas

- Less common tumors are malignant Brenner tumor

- Transitional cell carcinoma of the ovary (also rare).

Germ cell tumor accounts for approximately 30% of ovarian tumors but only 5% of ovarian cancers; because most germ cell tumors are teratomas and most teratomas are benign. Germ cell tumors tend to occur in young women and girls.

They include:

- Immature teratoma

- Dysgerminoma

- Endodermal sinus tumor

- Embryonal carcinoma

- Choriocarcinoma

Sex cord-stromal tumor accounts for 8% of ovarian cancers, including:

- Estrogen-producing granulosa cell tumor

- VirilizingSertoli-Leydig cell tumor.

- Thecal cell tumors

Mixed tumors are the ones containing elements of more than one of the above classes of tumor histology.

10% of ovarian cancers are due to metastases. Common primary cancers ari breast cancer gastrointestinal cancer & female genital tract.

Ovarian cancer is bilateral in 25% of cases.

Certain radiologic findings predominate for each type of tumor. Knowledge of these key features of ovarian tumors provides the criteria for making a specific diagnosis or substantially narrowing the differential diagnosis.

In a study done in USA Department of Radiology, Memorial Sloan-Kettering Cancer Center, New York 2008 for testing the accuracy of CT in Characterization of anneal masses, the result was that, Contrast-enhanced helical CT is highly accurate in characterizing anneal masses as malignant. Recognition of the computed topographic features most often associated with anneal malignancy will assist in more confident use of this modality and may potentially obviate the need for additional imaging studies before treatment selection.

In another study done in China, departments of Diagnostic Radiology and Genecology, Zhejiang University, 2006, the overall accuracy of CT staging for advanced ovarian carcinoma was 87.5% & 86.5% for stage III and IV patients respectively. Epithelial tumors when malignant are associated with varying proportions of cystic & solid component .figure(2.1). Profuse papillary projections are highly suggestive of borderline (low-malignant-potential) or malignant tumor.

At CT, fat attenuation within a cyst, with or without calcification in the wall, is diagnostic for mature cystic teratomas. Malignant germ cell tumors manifest as a large, complex abdominal mass that contains both solid and cystic components.

The radiologic appearance of sex cord—stromal tumors varies from small solid masses to large multicystic masses.

Granulosa cell tumors are usually large multicystic masses with solid components.figure (1-2)

Fibrothecoma, sclerosing stromal tumor, and Sertoli-Leydig cell tumors are usually solid masses. CT shows a homogeneous solid tumor with delayed enhancement.

Imaging findings in metastatic lesions are nonspecific, consisting of predominantly solid components or a mixture of cystic and solid areas.
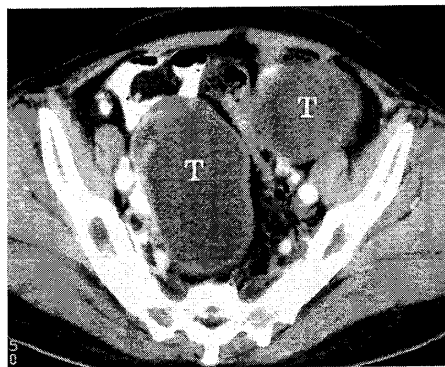

figure (1-3) bilateral serous cystadenocarcinomas in a 50 years old woman. Contrast-enhanced CT scan shows bilateral ovoid tumors (T) with some septa and mural nodules.
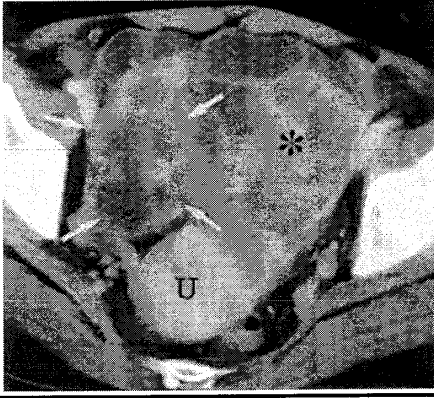
figure (1-4) Granulose cell tumor in a 55 years old woman. Contrast-enhanced CT scan shows a large, complex mass with a lobular contour, multiple cysts with a

"bunch of grapes" appearance on the right (arrows), and an irregularly enhancing solid portion on the left (*). U = uterus

2.3.2 CA ENDOMETRIUM:

Endometrial cancer is the commonest type of malignancy in UK, and in 2008 it affects 7703 cases. It is the third most common cause of gynecologic cancer death (behind ovarian and cervical cancer). The incidence is on a slow rise secondary to the obesity epidemic. It appears most frequently between ages of 55 and 65, and uncommon below 40.

Symptoms may include vaginal bleeding and/or spotting in postmenopausal women, abnormal uterine bleeding, abnormal menstrual periods, or lower abdominal pain.

Routine screening of asymptomatic women is not indicated, since the disease is highly curable in its early stages. Results from a pelvic examination are frequently normal, especially in the early stages of disease. Changes in the size shape or consistency of the uterus and/or its surrounding, supporting structures may exist when the disease is more advanced. Patients with newly-diagnosed endometrial cancer routinely undergo imaging studies, such as CT scans, to evaluate for extent of disease. Women with stage 1 disease who are at increased risk for recurrence and those with stage 2 disease are often offered surgery in combination with radiation therapy. Chemotherapy may be considered in some cases, especially for those with stage 3 and 4 disease. Hormonal therapy with

progestins and antiestrogens has been used for the treatment of endometrial stromal sarcomas.

While endometrial cancers are 40% more common in Caucasian women, an African American woman who is diagnosed with uterine cancer is twice as likely to die (possibly due to the higher frequency of aggressive subtypes in this population, but more probably due to delay in the diagnosis).

There are two pictures of this disease, perimenopausal women with estrogen excess and in older women with endometrial atrophy. Most endometrial cancers are adenocarcinomas. There are many subtypes of endometrial carcinoma, including:

- The common endometrioid type

- More aggressive papillary serous carcinoma

- Clear cell endometrial carcinomas. figure (1.5)

- Squamous cell carcinoma

Other subtypes arise from other tissues of the uterus, including

- sarcoma of the myometrium

- Trophoblastic disease.

- Mixed miillerian tumors

Mullerian tumor account for between 2%-5% of all tumors derived from the body of the uterus, and is found predominantly in postmenopausal women with an average age of 66 years. Risk factors are similar to those of adenocarcinomas and include obesity, exogenous estrogen therapies, and nulliparity. Less well-understood but potential risk factors include tamoxifen therapy and pelvic irradiation.

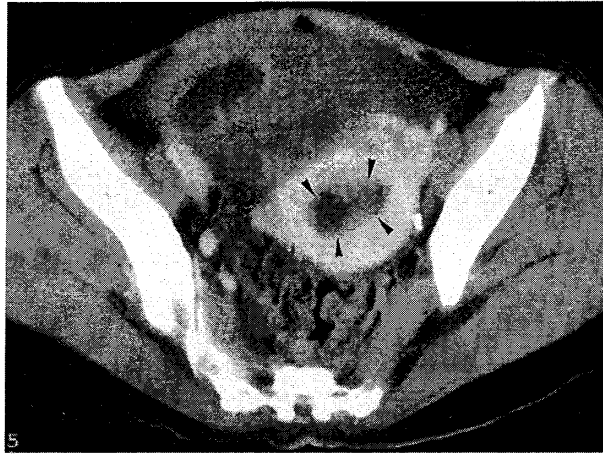A total abdominal hysterectomy with bilateral salpingo-oophorectomy is the most common therapeutic approach.

Image (1.5) Endometrioid carcinoma of the ovary and endometrial carcinoma of the uterus in a 38-year-old woman. Contrast-enhanced pelvic CT scan shows a widened endometrial cavity with a nodular enhancing solid mass (arrowheads).

2.3.3 CA CERVIX:

Cervical cancer is one of the most common and the fifth killing cancer in women. Approximately 80% of cervical cancers occur in developing countries.

In a retrospective analysis performed in histopathologically proven gynecological malignancies done in Nepal between July 1999 and April 2004, cervical cancer was the most frequent gynecological malignancy. (1Again in a study done in Ghana cervical cancer was the commonest, constituting about 57.8% of gynaecological cancers. Infection with some types of human papilloma virus (HPV) is the greatest risk factor for cervical cancer, almost all cases (90%) of cervical cancer. followed by smoking. Other risk factors include human immunodeficiency virus.

Most cervical cancers are squamous cell carcinomas (80-85%). Adenocarcinoma (16%) is the second most common type. Very rarely, cancer

can arise in other types of cells in the cervix, like the neuroendocrine tumors (small cell tumors).

The early stages of cervical cancer may be completely asymptomatic. Vaginal bleeding, contact bleeding, or rarely a vaginal mass may indicate the presence of malignancy. Also moderate pain during sexual intercourse and vaginal discharge are symptoms of cervical cancer. In advanced disease, metastases may be present in the abdomen, lungs or elsewhere.

Treatment usually consists of surgery in early stages, and chemotherapy and/or radiotherapy in more advanced stages of the disease.

Prognosis depends on the stage of the cancer. With treatment, 80 to 90% of women with stage I cancer and 60 to 75% of those with stage II cancer are alive 5 years after diagnosis. Survival rates decrease to 30 to 40% for women with stage III cancer and 15% or fewer of those with stage IV cancer 5 years after diagnosis.

The accuracy of CT scan in detecting cervical cancer depends upon the stage of the tumor; unfortunately it is unable to detect early stages of cancer. In a study done in department of Diagnostic Radiology, Cancer Institute, Chinese Academy of Medical Sciences China, CT was not able to detect < or = Ia cervical carcinoma, however, CT was able to detect tumors in 71.4% of > or = lb 1 stage The overall accuracy of CT staging for tumor was 69.6% .
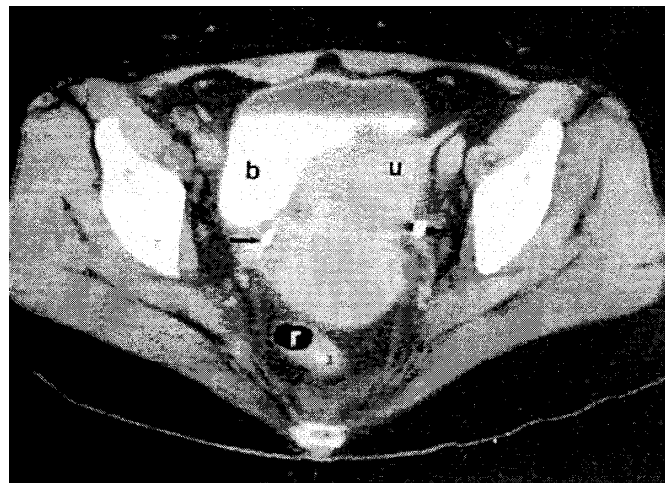

figure (1.6) Axial CT scan of the pelvis in a 55-year-old woman with cervical carcinoma causing obstruction of the uterus (u). (b, bladder; arrows, uterus; r, rectum.)

2.3.4 CA BLADDER:

In the United States, bladder cancer is the ninth most common cancer in women. More than 16,000 women are diagnosed with bladder cancer each year.

90% of bladder cancers are transitional cell carcinoma. The other 10% are squamous cell carcinoma, adenocarcinoma, sarcoma, small cell carcinoma, and secondary deposits from cancers elsewhere in the body. Bladder diverticula have an increased risk (2%-10%) of developing cancer because of stasis. All major epithelial types have been reported, but urothelial cancer is the most common neoplasm in bladder diverticula. At CT, urothelial carcinoma appears as an intraluminal papillary or nodular mass or focal wall thickening. Lesions may be missed withoutadequate bladder distention, especially small, flat tumors. CT demonstrates tumoral calcification in approximately 5% of cases. The calcification typically encrusts the surface of the tumor and may be nodular or arched. Bladder tumors enhance early, approximately 60 seconds from injection, and may be readily detected with multidetector CT. In one series of 20 patients, 100% of tumors were detected.

With progression of disease, wall thickening may become diffuse. The presence of ureteral obstruction strongly suggests the presence of muscle invasion. Once the tumor has extended into the perivesical fat, increased attenuation or infiltration is noted in the fat.

The imaging findings in squamous carcinoma are nonspecific. Tumors may appear as a single enhancing bladder mass or as diffuse or focal wall thickening. Intradiverticular squamous tumors are soft-tissue masses, sometimes with surface calcification. In contrast to urothelial carcinoma, squamous carcinoma is sessile rather than papillary, and pure intraluminal growth is not seen. Bladder wall thickening and calcification, from chronic inflammation or infection with Bilharzia, may coexist and complicate the diagnosis. Muscle invasion is present in 80% of cases and extravesical spread may be extensive, involving surrounding organs and the abdominal wall.

In a study done in department of Urology, Faculty of Medicine, University of Ankara, Ankara, Turkey 2008, CT has limited accuracy in detecting perivesical

infiltration and lymph node metastasis in invasive bladder carcinoma. The information provided by CT is insufficient.
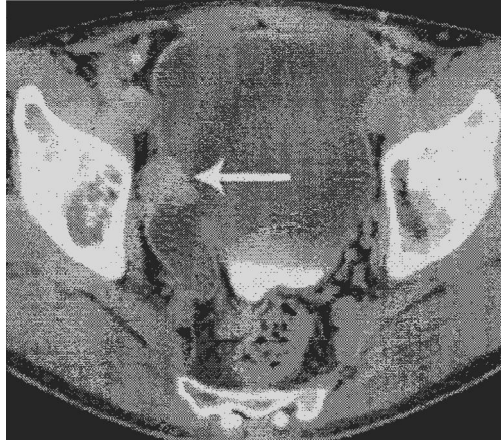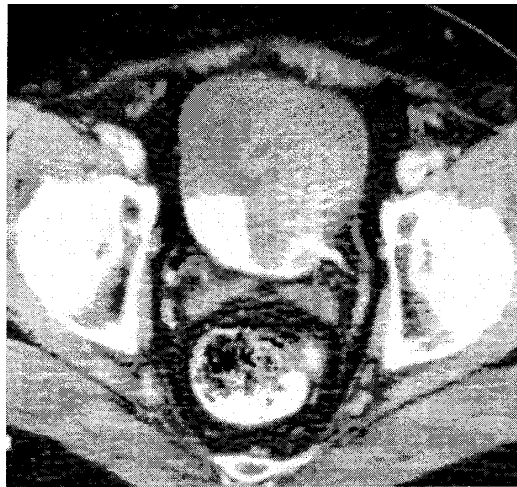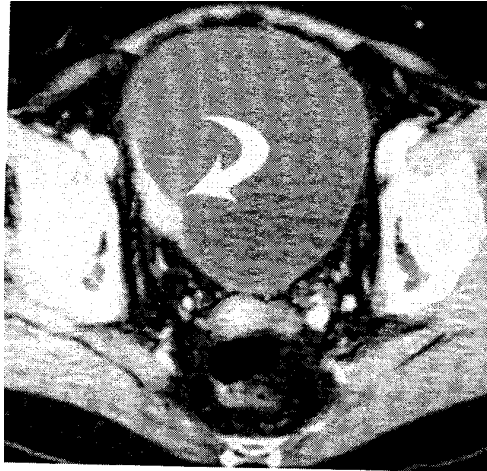

Image (1.7) Diverticular tumor. Axial CT image shows aurothelial tumor (arrow) within a bladder diverticulum. Urinary stasis occurs with bladder diverticula, thus predisposing them to tumor development.

(1.8)Urothelial carcinoma. Axial CT image shows a large, lobular mass within the bladder.

(1.9)Urothelial carcinoma. Axial CT image of the bladder shows an enhancing area of focal wall thickening (arrow), which represents aurothelial carcinoma. Flat lesions are more difficult to detect with radiologic studies, especially if the bladder lumen is not well distended.

(1.10) Squamous cell carcinoma a -paraplegic patient. Axial unenhanced CT image of the bladder shows calcifications (arrow) encrusting a tumor.

2.3.5 CA RECTUM:

Of the 150,000 cases of colorectal cancer diagnosed each year in the United States, more than 40,000 people are diagnosed with rectal cancer. The most common type of rectal cancer is adenocarcinoma, which is a cancer arising from the mucosa. Others include; leiomyosarcoma& metastasis.

Rectal cancer usually develops over several years, first growing as a precancerous growth, a polyp. Some polyps have the ability to turn into cancer and begin to grow and penetrate the wall of the rectum. The actual cause of rectal cancer is unclear. However, the following are risk factors for developing rectal cancer; Increasing age, smoking, family history of colon or rectal cancer, high-fat diet and/or a diet mostly from animal sources. Routine cancer screening of the colon and rectum is the best way to prevent rectal cancer.

MRI is the best choice in investigating the rectal cancer & its extension, although CT can give valuable information in diagnosing rectal carcinoma. In a study done in department of Radiology, McMaster University Medical Centre, Hamilton, Ontario, Canada, the findings suggest that multidetector-row CT does not correlate well enough with MRI findings to replace it in rectal cancer staging

2.9.1 Findings on CT that suggest rectal carcinoma include the following:

- The rectal tumor is often observed as a focal mass of soft-tissue density adjacent to the gas-filled or Gastrografin-filled bowel lumen

- Malignant strictures are detected by a thickening of the bowel wall; this thickening is concentric if the scanning plane is at right angles to the long axis of the rectum, CT scan for low rectal carcinoma preoperative staging.

- Extrarectal tumor spread is suggested by a loss of tissue fat planes between the rectum and surrounding tissues, as well as perirectal fat stranding and nodularity .

- Invaded muscle may be enlarged

- Small strands of tissue may extend from the rectal wall into the perirectal fat

- CT findings help to determine surgical options; precise information concerning the site and local extent of the tumor is required before the appropriate surgical choice can be made; well-defined tumors (stage Ti or T2) may be amenable to simple resection or low anterior resection, whereas more advanced tumors (T3) may require abdominoperineal resection or anterior resection, depending on their location; perioperative adjuvant radiotherapy or chemotherapy may be used.

- Hepatic metastases are the most common site of distant tumor spread. CT detects hepatic metastases as well-defined areas of low density (compared to normal liver parenchyma) in the portal venous phase, following injection of intravenous contrast medium. In the earlier arterial phase, hepatic metastases may demonstrate rim enhancement or become hyperdense or isodense (in relation to normal liver) .

- Pulmonary metastases are more frequent from lower rectal carcinomas than upper rectal or colon carcinomas • Bony and cerebral metastases are uncommon.
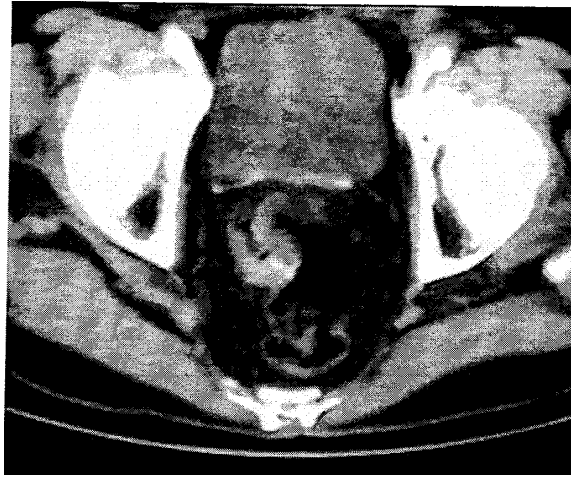
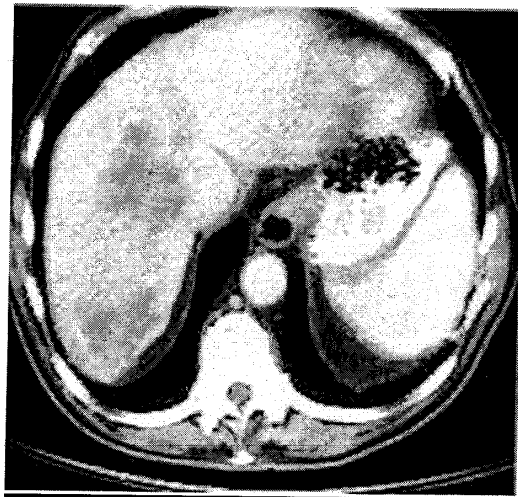Figure (1.11) CT scan of wall thickening in a rectal carcinoma.

Figure (1.12)CT scan following intravenous contrast medium, revealing hypodense lesions in the right lobe of the liver from metastases of a rectal adenocarcinoma.

2.4 CT protocol for ABDOMEN AND PELVIS for gynecological malignancy and rectal Ca

Fasting :

Patients should be well hydrated for the exam in order to decrease renal complications from I.V. contrast , so they should have nothing but clear liquids at least 4 hours before the exam.

Oral Contrast:

Positive oral contrast is usually barium (1 - 3% concentration). Barium Protocol: 60 min prior — 250 mL, 30 min prior — 250 mL, Table — 400 mL water

Rectal Contrast:

Rectal contrast is administered via a catheter and enema bag (1 - 3% hypaque or water preferably) while the patient is on the scanning table. 200 cc usually adequately opacities the rectosigmoid. Stop if patient has significant discomfort .

Chapter three

Materials and methods

3.1 Material:

3.1.1 Study design:

Cross sectional institutional/hospital based study.

3.1.2 Sample size:

Sample size is 70. Study population: Female Patients underwent CT abdomen for evaluation of pelvic mass and underwent operation with histopathological examination that confirm pelvic malignancy.

3.1.3 Inclusion criteria:

Sudanese female patients underwent CT abdomen & pelvis for evaluation of pelvic mass and underwent operation with histopathological examination that confirms malignancy.

3.1.4 Exclusion criteria:

Patients who are not Sudanese, not in the determined period or in other hospitals. Data collection technique: The data collected through interviewer filled questionnaire.

3.1.5 Data collection tool:

Close ended questionnaire

3.1.6 Study area :

The study done in RICK center which located in Khartoum city.

3.1.7 Study period:

 In the period between march 2016 to september 2016.

3.2 methodology:

3.2.1 Data management and analysis:

Data will be managed using the computer data base management and analysis will be performed by using the statistical package for social science (SPSS); version 19.

3.2.2 Ethical concern:

Verbal consent will be obtained from RICK center's administer after informing them about the purposes and objectives of the study, providing that all the information will be confidential and will only be used in the purposes of the study.

Chapter four

Results

Results

- Our study included 70 female patients, who presented to RICK for treatment for pelvic malignancy(C ovary, Ca uterus, Ca cervix, Ca Urinary bladder, &Ca rectum). The age distribution of our study population was found to be, 11 patients below the age of 40(15.7%), & 59 patients above the age of 40(84.3%),

- In more details: 1patient between 10-19 years (1.4%),4 patients between 20-29 years (5.7%), 6 patients between 30-39 years(8.6%) and 12 patients between 40-49 (17.1%), 13 patient between 50-59 years (18.6%),16 patients between 60-69 years (22.9%),13 patient between 70-79 years (18.6%),5 patients between 80-89 years (7.1%).(figure4.1)

- Ca ovary affect 3 1patients (44.%),then Ca cervix,l9patients (27.1%) ,Ca uterus,9 patients(13%), Ca rectum 9 patients(12.9%), and the least type was Ca urinary bladder, 2 patients(2.9%) .(figure 4.2)

- The accurate diagnosis made by CT, confirmed with histopathololgical exam was done in 60 patients(85.7%), and about 10 patients(14.3%) the diagnosis was not accurate, specifically in cases with Ca rectum & urinary bladder(figure4.3)

- The mixed adenexial tumors made(32.9%) of Ca ovary cases, while solid masses and cystic masses represents an equal percentage(10%)for each.(figure4.4)

- In cases diagnosed with Ca uterus(66.7%)of patients presented with mass lesion, followed by (22.2%)reported as normal uterus, and (11.1%) as uterine enlargement with normal texture.(figure 4.5)

- Endometrial collection was seen in only (22%) of patients diagnosed with Ca uterus.(figure4.6).

- In cases diagnosed with Ca cervix, (84%)of patients presented with a mass in the CT,while (16%)of patients were diagnosed as normal cervix.(figure4.7)

- In cases diagnosed with Ca urinary bladder ,(87.1%)were diagnosed as normal.(figure4.8)

- In cases with Ca rectum ,(66.7%)presented with abnormal wall thickening,(22.2%)presented with rectal mass.(figure 4.9)

- In CT included in our study, the enhancement was not mentioned in (8.6%)of cases, while it was significantly present in (37.1%)and absent in (54.3%)of cases.(figure 4.10)

- Ascitis was absent in (74.3%)of our cases, and just present in (25.7%). (figure 4.11)

- The bony pelvis was normal in the majority of cases (98.6%),and just involved in (1.4%).(figure 4.12)

- Pelvic lymph nodes were involvement in (17.1%), and was normal in (82.9%). Figure(4.13)

- Distant metastasis were present in (28.6%) of reported cases, and absent in (71.4%).figrue(4.14)

- Omental metastasis was present in(55%) of our patients, followed by liver &lung(15%),and each of liver, lung and bone were equally seen in CT of our patients(10%). Figure(4.15)

- Epithelial tumors of Ca ovary, constituting (79.0%) of our histological subtypes.

- The second histological subtype was sex cord tumors(16%),then germ cell tumors and ovarian metastasis made (6.5%).figrue(4.16)

- The commonest histological type of Ca cervix was squamous cell carcinoma(89%),followed with adenocarcinoma(11%).figrue(4.18)

- About (77.7%) of cases diagnosed with Ca uterus were adenocarcinomas, (11%)were trophoblastic tumors, and also(11%) were of mixed malleriantumors.figrue(4.17)

All our cases diagnosed with Ca urinary bladder found to be squamous cell carcinomas(100%) .(figure 4.19) All our cases diagnosed with Ca rectum found to be adenocarcinomas(I 00%).figrue(4.20) In our study, there was no significant relationship between the type of malignancy and the age, all types increase with increase in age.(P value 0.646)
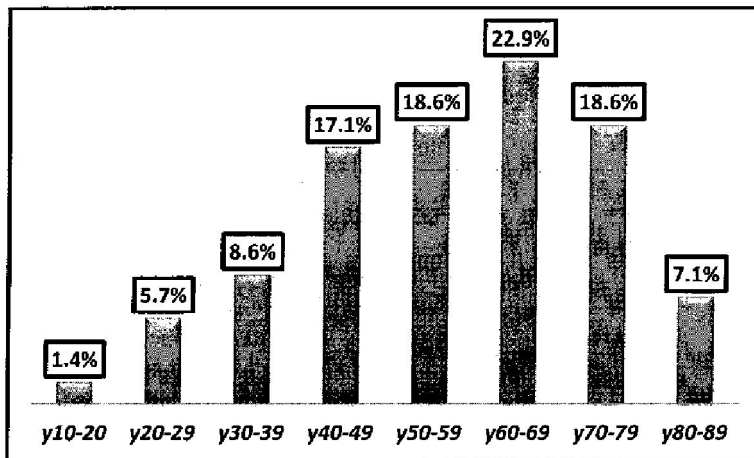
Figure(4.1): Age distribution of patients with pelvic malignancy in enhanced CT abdomen in RICK between 1.3.2016-1.9.2016 (n70)
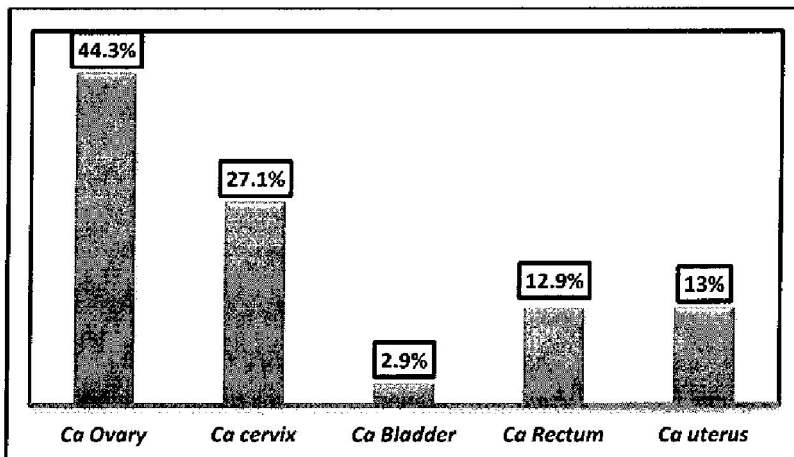

Figure(4.2): Frequency distribution of type of pelvic malignancy in patients with pelvic masses in enhanced CT abdomen in RICK between 1.3.2016-1.9.2016 (n70)
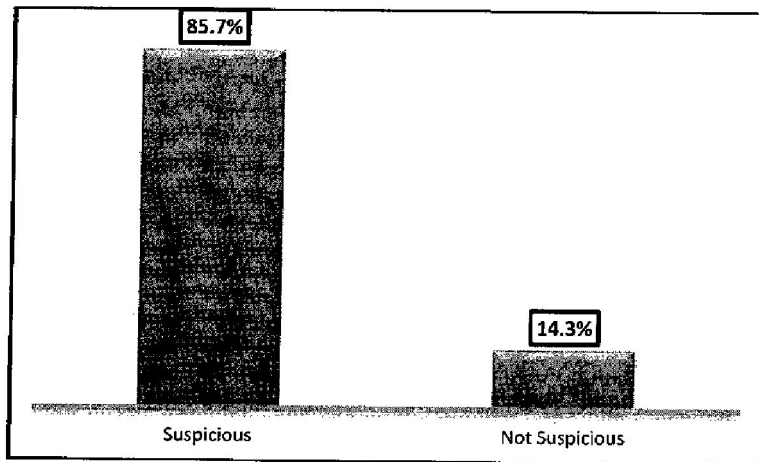
Figure(4.3): Percentage of accurate diagnosis of pelvic masses confirmed with histopathology in patients with pelvic masses in enhanced CT abdomen in RICK between 1.3.201-1.9.2016 (n70)
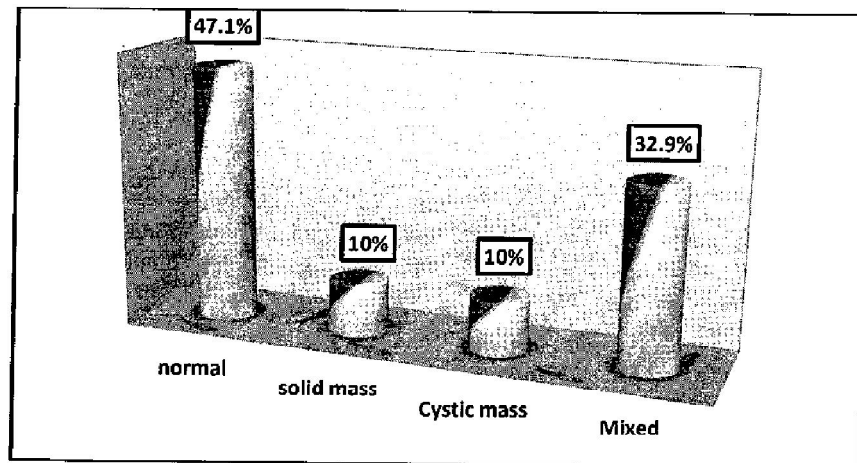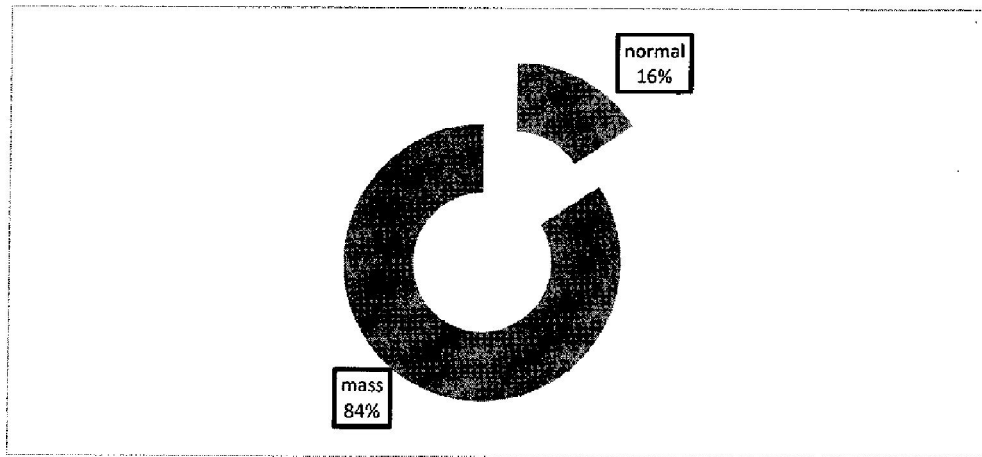

Figure(4.4): This demonstrate the pattern of adenexial involvement in patients with pelvic masses in enhanced CT abdomen in RICK between 1.3.2016-1.9.2016 (n70)
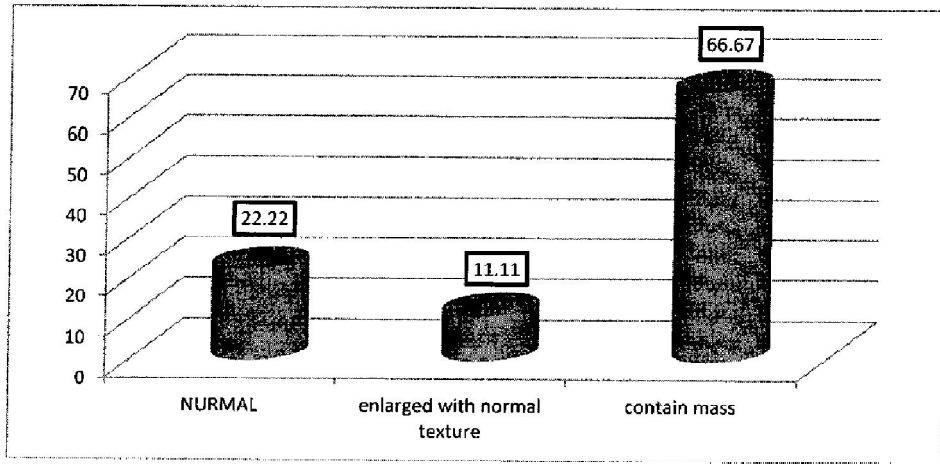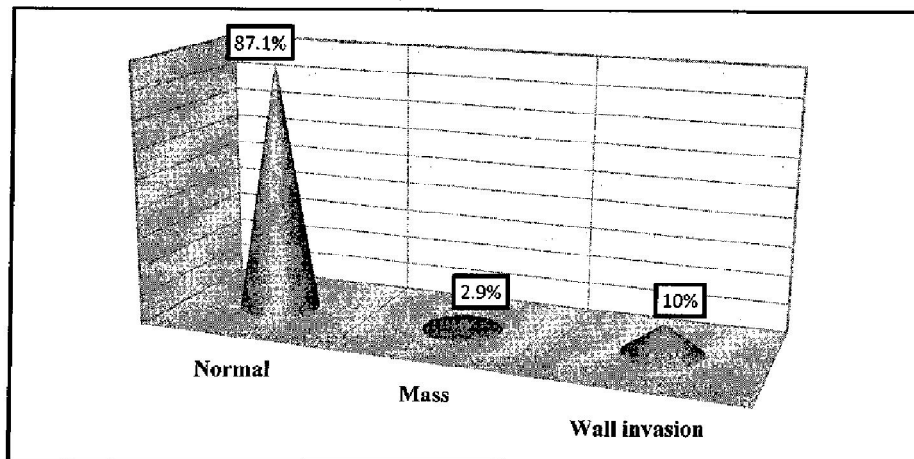
Figure(4.5): This demonstrate the Percentage of pattern of involvement of uterus in Ca uterus in patients with pelvic masses in enhanced CT abdomen in RICK between 1.3.2016-1.9.2016 (n9)
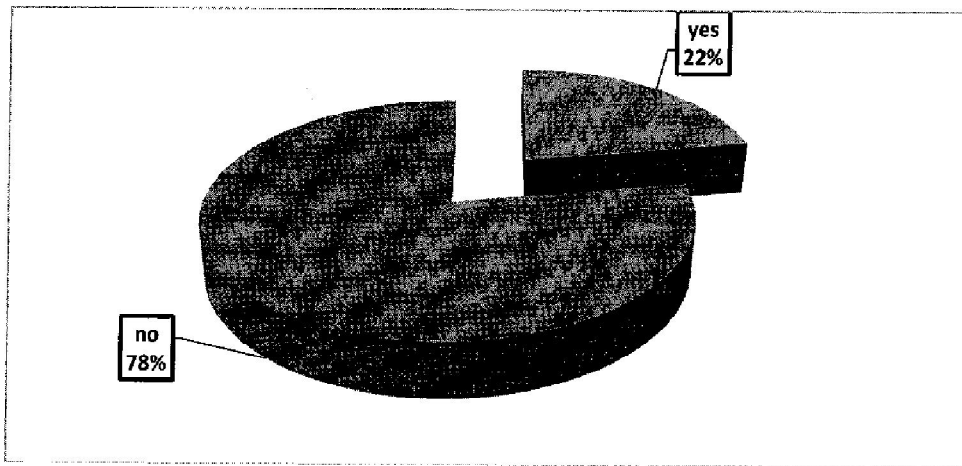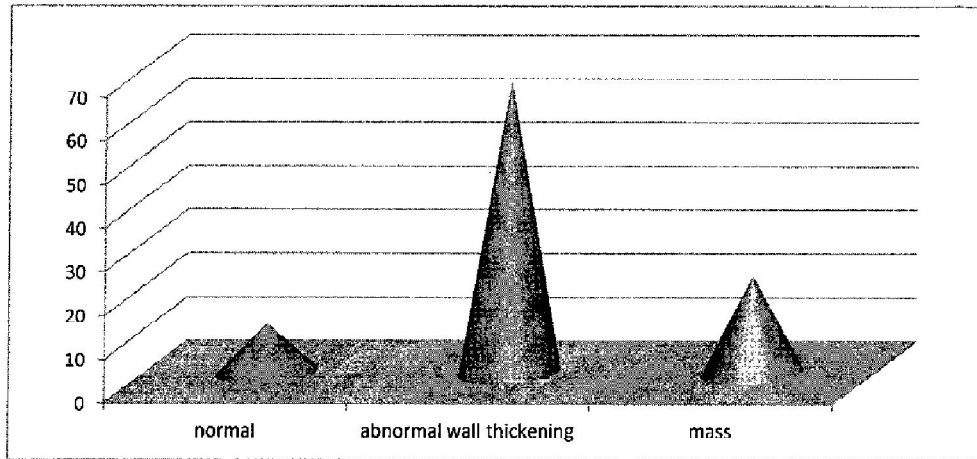

Figure(4.6): This demonstrate the Percentage of endometrial collection in patient diagnosed with Ca uterus in patients with pelvic masses in enhanced CT abdomen in RICK between 1.3.2016-1.9.2016 (n9).
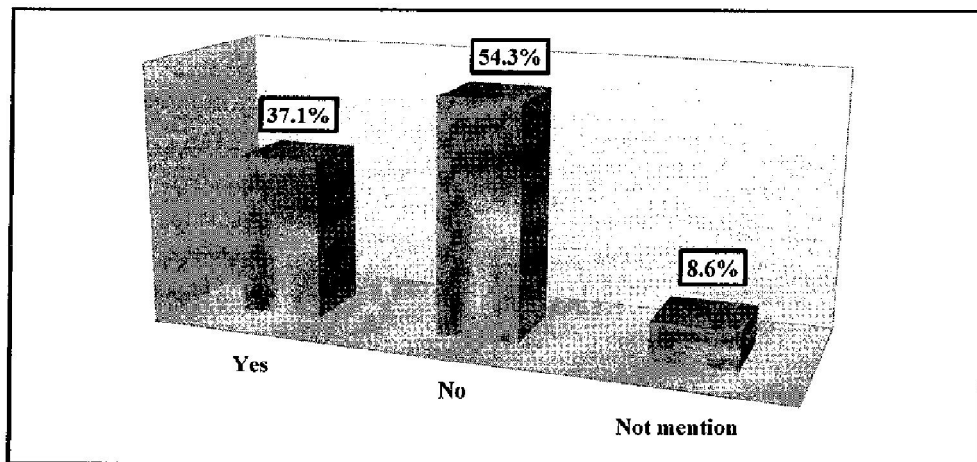
Figure(4.7): This demonstrate the Percentage of cervical involvement in patients with Ca cervix in enhanced CT abdomen in RICK between 1.3.2016-1.9.2016

Figure(4.8): This demonstrate the pattern of urinary bladder involvement in patients with Ca urinary bladder in patients with pelvic masses in enhanced CT abdomen in RICK between 1.3.2016-1.9.2016 (n 2)
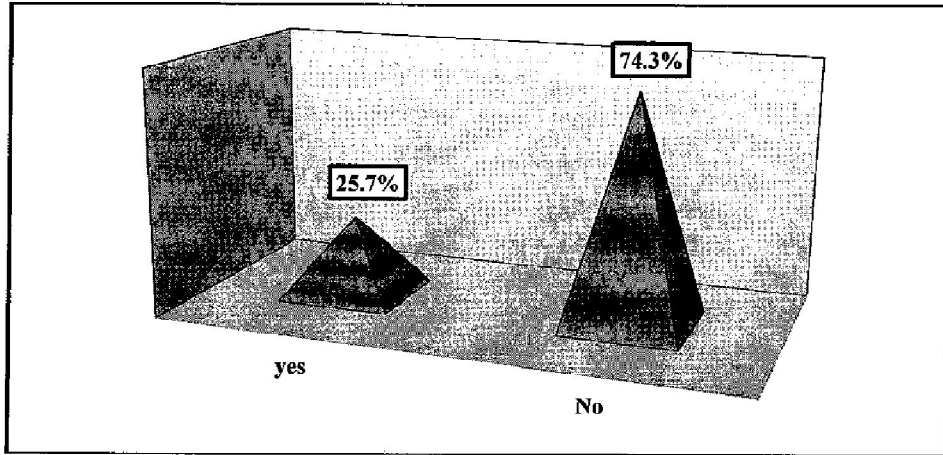
Figure(4.9): This demonstrate the pattern of rectal involvement in patients with Ca rectum in patients with pelvic masses in enhanced CT abdomen in RICK between 1.3.2016-1.19.2016 (n9)

Figure(4.10): This demonstrate the percentage of the enhancement of the pelvic mass in patient with pelvic masses in enhanced CT abdomen in RICK between 1.3.2016-1.9.2016 (n70)

Figure(4.11): This demonstrate the percentage of presence of ascites in patients with pelvic masses in enhanced CT abdomen in RICK between 1.3.2016-1.9.2016 (n70)

Figure(4.12): This demonstrate the percentage of involvement of bony pelvis in patients with pelvic masses in enhanced CT abdomen in RICK between 1.3.2016-1.9.2016 (n70)

Figure(4.13): This demonstrate the percentage of presence of pelvic lymph nodes in patients with pelvic masses in enhanced CT abdomen in RICK between 1.3.2016-1.9.2016 (n70)

Figure(4.l4): This demonstrate the percentage of presence of distant metastasis in patients with pelvic masses in enhanced CT abdomen in RICK between 1.3.2016-1.9.2016 (n70)
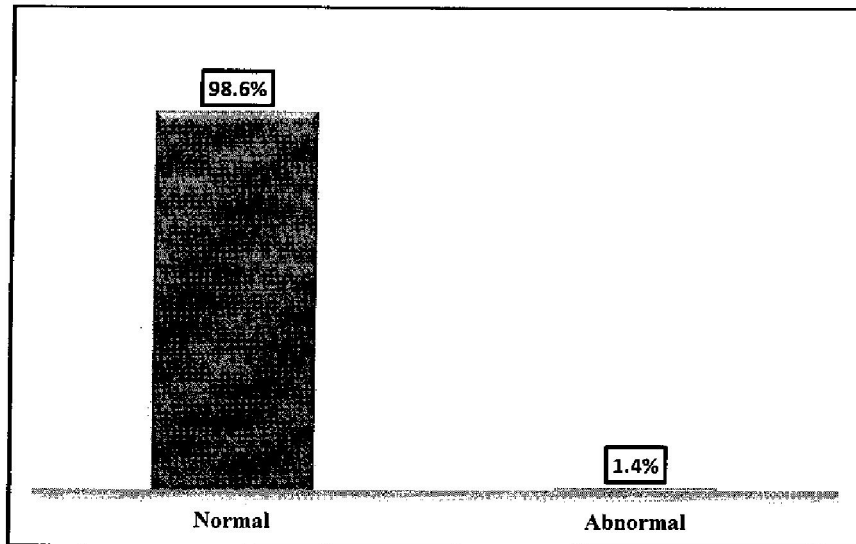
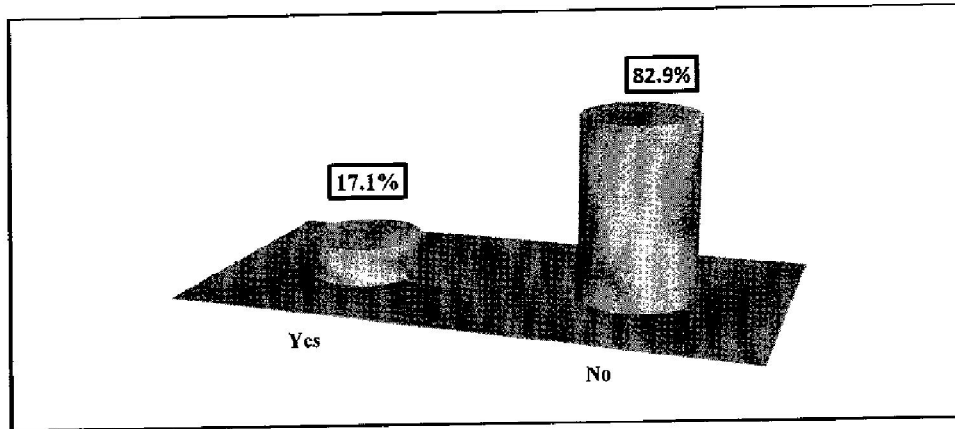**Figure(4.15):** This demonstrate the percentage of type of distant metastasis in patients with pelvic masses in enhanced CT abdomen in RICK between 1.3.2016-1.9.2016 (n70)

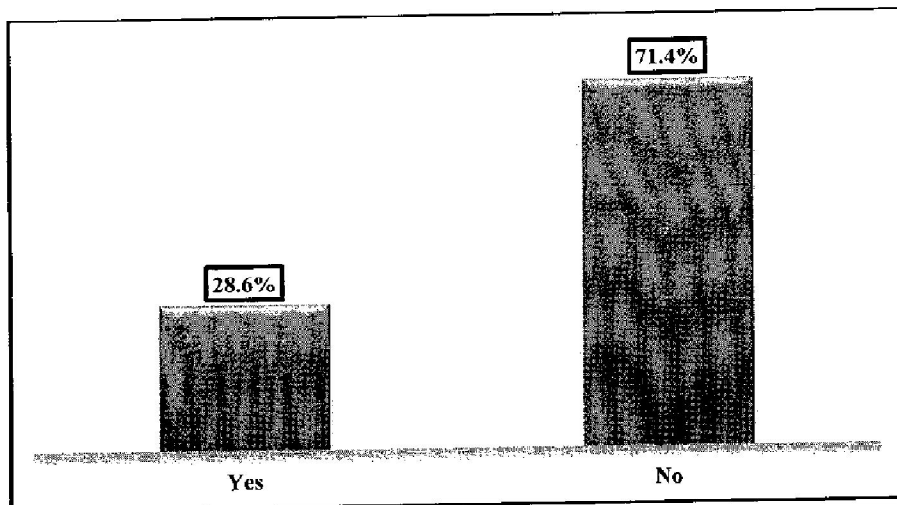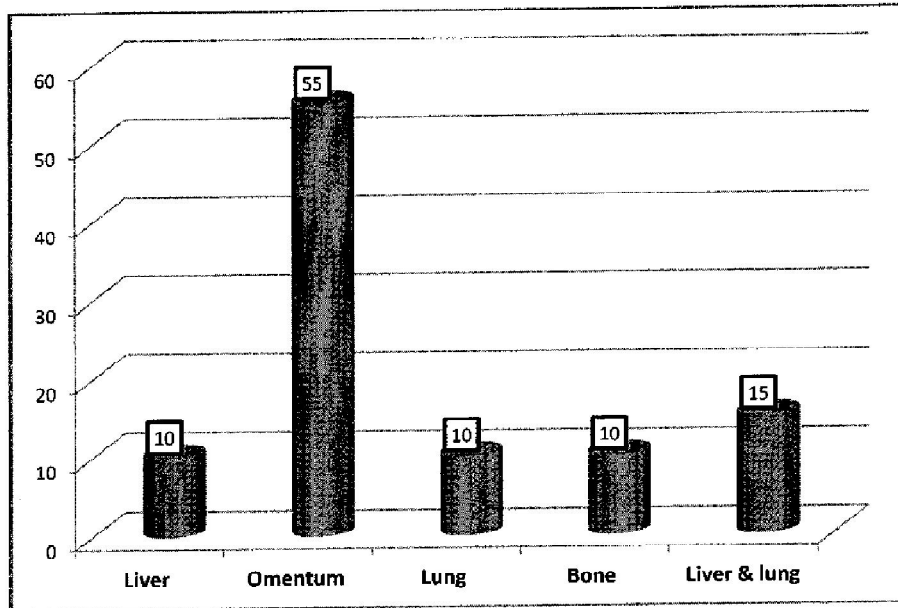Figure (4.16): This demonstrate the histological subtypes of Ca ovary in patients with pelvic masses in enhanced CT abdomen in RICK between 1.3.2016-1.9.2016 (n31)

Figure (4.17): This demonstrate the histological subtypes of Ca uterus in patients with pelvic masses in enhanced CT abdomen in RICK between 1.3.2016-1.9.2016 (n9)

Figure (4.18): This demonstrate the histological subtypes of Ca cervix in patients with pelvic masses in enhanced CT abdomen in RICK between 1.3.2016-1.9.2016 (n19)
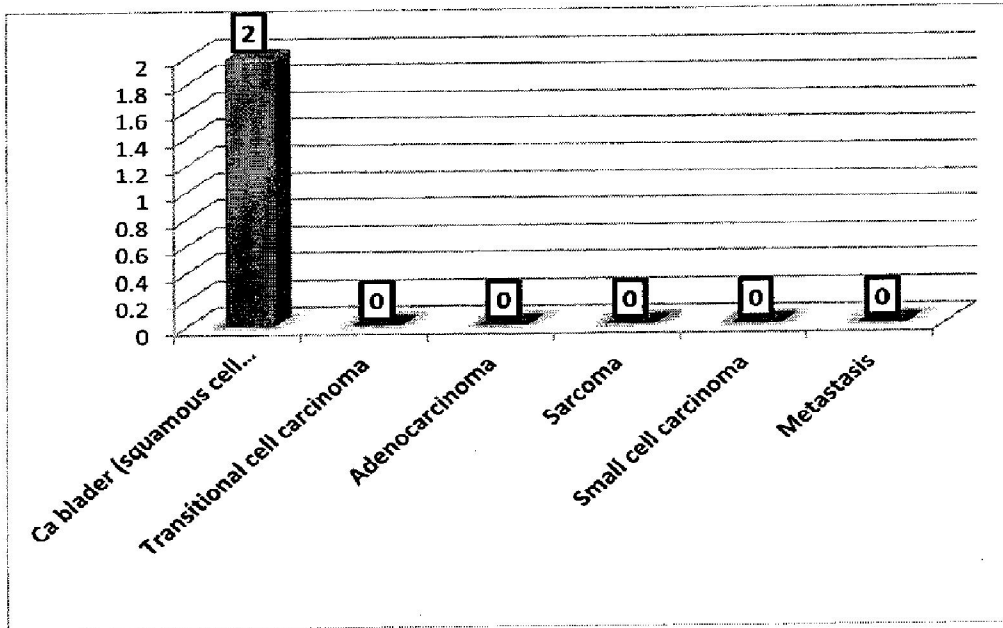
Figure (4.19) : This demonstrate the histological subtypes of Ca urinary bladder in patients with pelvic masses in enhanced CT abdomen in RICK between 1.3.2016-1.9.2016 (n2)
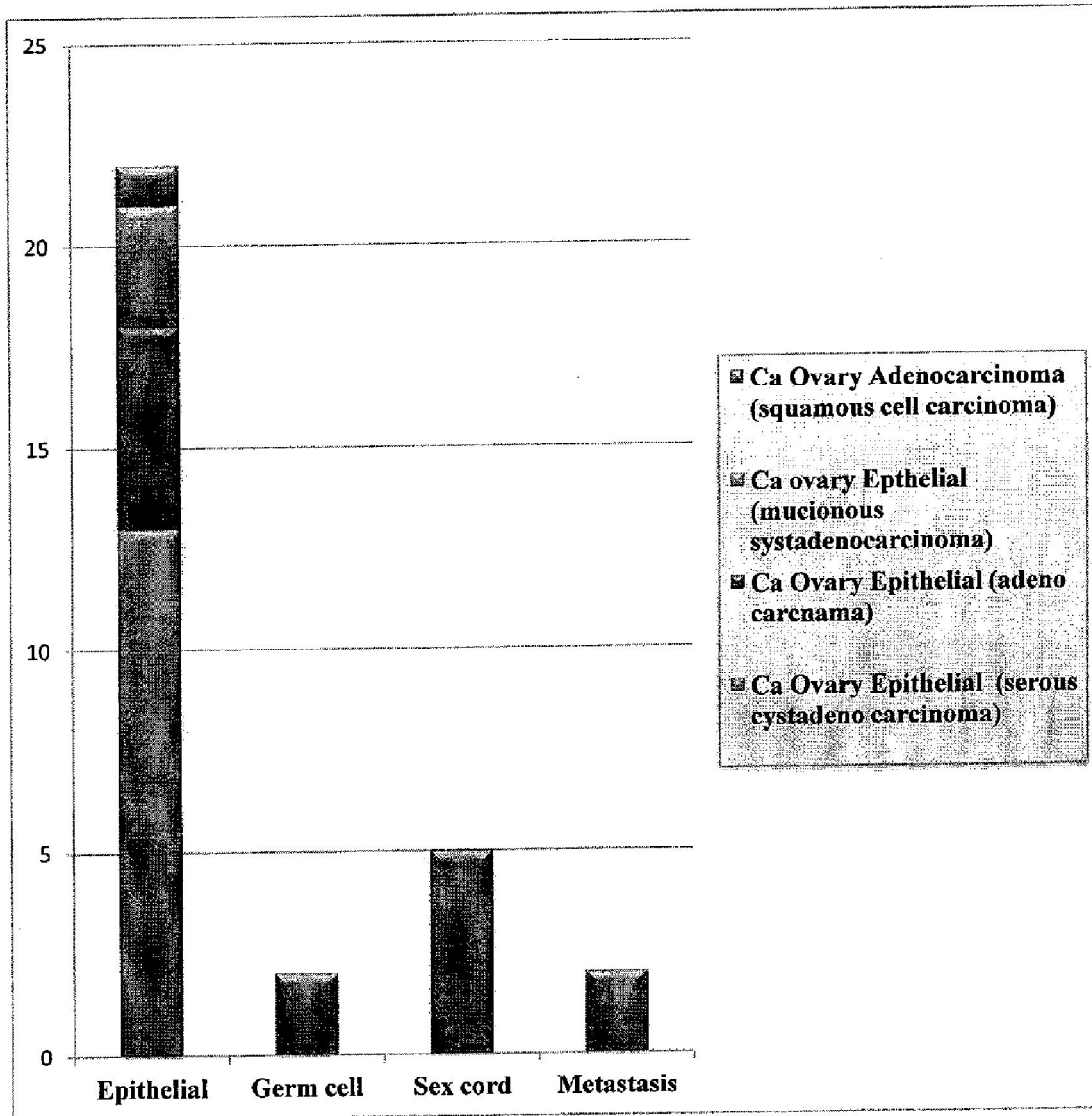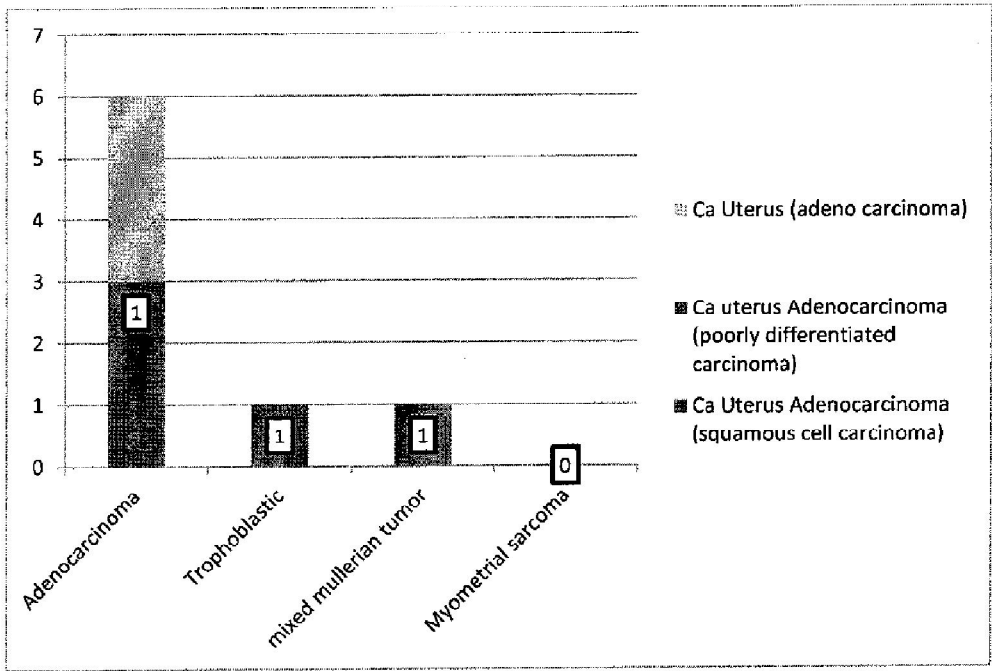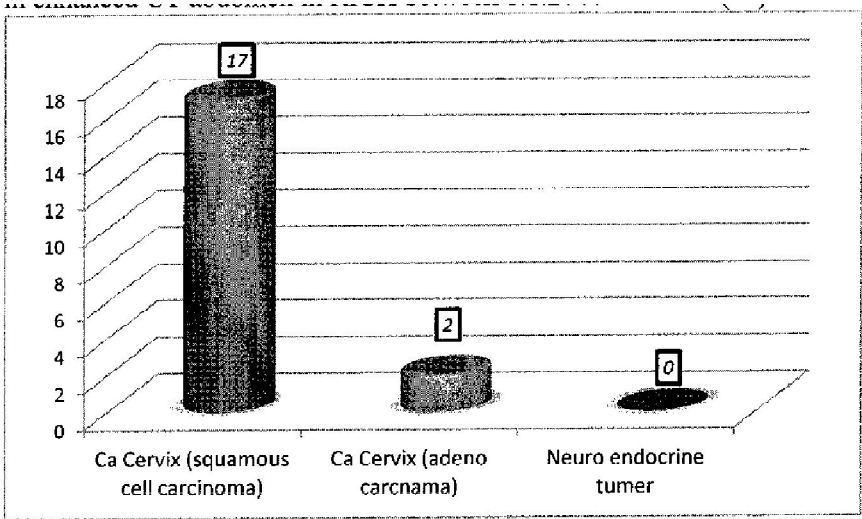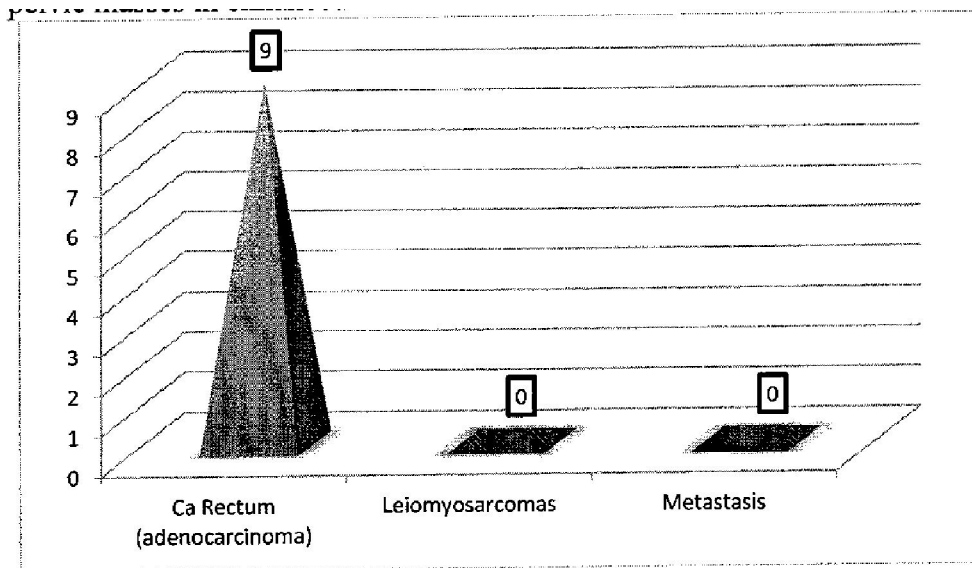

Figure (4.20): This demonstrate the histological subtypes of Ca rectum in patients with pelvic masses in enhanced CT abdomen in RICK between 1.3.2016-1.9.2016 (n 9)

39

Crosstabs:

ale& type of malignancy

age * VAR00001 Crosstabulation

Count

		VAR00001					Total
		a	b	c	d	e	
age	10-19	1	0	0	0	0	1
	20-29	1	0	2	0	1	4
	30-39	3	2	0	0	1	6
	40-49	7	3	0	0	2	12
	50-59	5	5	0	1	2	13
	60-69	6	3	5	1	1	16
	70-79	6	3	2	0	2	13
	80-89	2	3	0	0	0	5
Total		31	19	9	2	9	70

a=ovarian, b=endometrial, c=cervical, d= UB, e=rectum

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	24.781[a]	28	.640
Likelihood Ratio	28.592	28	.433
N of Valid Cases	70		

a. 36 cells (90.0%) have expected count less than 5. The minimum expected count is .03.

Table:

This demonstrate there is no effect of age on the type of pelvic malignancy in patients with pelvic masses in enhanced CT abdomen in RICK between 1.1.2010-1.1.2013 (n70) (P value=0.640)

Final diagnosis & Distal metastasis :

Crosstab

Count

	Distal metastasis		total
	yes	no	
VAR0001A	11	20	31
B	3	16	19
C	4	5	9
D	0	2	2
E	2	7	9
total	20	50	70

Chi-square tests

	valid	df	Asymp.sig.(2-sided)
Pearson Chi-square	4.336[a]	4	.362
Likelihood ratio	4.959	4	.291
N of valid case	70		

a.4 cells (40.0%) have expected count less than 5. The minimum expected count is .57

 a=ovarian, b=endometrial, c=cervical, d= UB, e=rectum

Table 2: This demonstrate there is no effect of type of malignancy in the presence or absence of distant metastasis in patients with pelvic masses in enhanced CT abdomen in RICK between 1.1.2010-1.1.2013 (n70) (P value=0.362)

CT protocol for ABDOMEN AND PELVIS for kvnecological

mali2nancy and rectal Ca in our hospital

-In our hospital, the use of rectal contrast is not used routinely, except if it is recommended by the radiologist or the physician.

Chapter five

Discussion Conclusion& Recommendation

5.1 Discussion:

• Frequency of pelvic masses increases with age.

• Accuracy of CT in diagnosing pelvic masses was (85%),& this percentage in keep with that found in the literature in a study done in China, departments of Diagnostic Radiology and Genecology, Zhejiang University,2006, in wich the overall accuracy of CT staging for advanced ovarian carcinoma was 87. 5%.

• The commonest type of pelvic malignancy was Ca ovary (44%), this is in contradistinction to the results of the previously mentioned studies wich done in Nepal & Ghana, (0 -9) that prove cervical cancer was the commonest type of malignancy in female, making 57.8% of gynaecological cancers.

• Epithelial tumors were the commonest subtype of Ca ovary, constituting (79.0%) of our histological subtypes, & this in keep with the literature(89.7%).

• The second commonest type was Ca cervix (27%).

• The commonest histological subtype of Ca cervix was squamous cell carcinoma(89%). This was in keep with that mentioned in the literature.

• The third commonest type was Ca uterus (13%).

• The commonest histological subtype of Ca uterus was adenocarcinomas (77.7%).

• The forth commonest type was Ca rectum (12.9%), this percentage may be affected by the fact that, most of the cases were assessed by using MRI rather than CT which can not replace MRI in staging rectal cancer,in reference to the study done in Canada.

• All our cases of Ca rectum were adenocarcinomas, and this is the most common type worldwide.

• The least type was Ca urinary bladder (2.9%)

• The diagnosis of Ca urinary bladder was made correctly in just 12.9% of the cases, and this make the CT has limited accuracy in detecting urinary bladder carcinoma. This was the result of a study done in Turkey whitch prove these limitations.

• All our cases of Ca urinary bladder were squamous cell carcinoma. This result was different from that in literature, most likely because it is the type associated with chronic infection and bilharzia.

5.2Conclusion & recommendations:

• Frequency of pelvic masses increases with age.

• CT is accurate in diagnosing ovarian, cervical and endometrial cancers

• CT is not accurate in diagnosing urinary bladder and rectal carcinomas.

• The commonest type of pelvic malignancy was Ca ovary (44%).

• The commonest histological subtype of Ca ovary was epithelial tumors (79%).

• The second commonest type was Ca cervix (27%).

• The commonest histological subtype of Ca cervix was squamous cell carcinoma(89%).

• The third commonest type was Ca uterus (13%).

• The commonest histological subtype of Ca uterus was adenocarcinomas (77.7%).
• The forth commonest type was Ca rectum (12.9%).

• All our cases of Ca rectum were adenocarcinomas.

• The least type was Ca urinary bladder (2.9%).

• All our cases of Ca urinary bladder were squamous cell carcinoma.

• Clinical history is very important to guide the radiologist to do the proper exam and to search specifically in the pelvis.

• Any case with suspicion of pelvic malignancy should receive rectal contrast as a protocol

• A further research is recommended to compare between the accuracy of pelvic ultrasound and pelvic CT, because a large proportion of cases presented to the RICK were just assessed with pelvic ultrasound.

• Further researches should be encouraged to identify the causes of missed or wrongly diagnosed cases

5.3Questionnaire

Name• lAge. date Final diagnosis by CT Findings in CT: - Uterus. Normal. Enlarged with normal texture. Contain mass. -Endometrial collection. Yes. No

-Adenexia normal Solid mass Cystic mass Mixed Calcification. Contain fat - Enhancement. YES NO Not mentioned - Cervix. Normal. Abnormal -Vagina. Normal. Abnormal -Urinary Bladder Normal mass wall invasion - Rectum.Normal Mass Wall invasion -Bony pelvis Normal Abnormal - Lymph node enlargement Yes No - Ascitis yes. No

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Patient data:

1.Name:………………..

2.Age:…………………

3. Date:…………………..

5.Final diagnosis by CT

Finding in CT:

a.Uterus:

Normal   .   enlarged   .   contain mass

b.endometrial collection:

YES   NO

c. adenexia:

Normal   .   solid mass   .   cystic mass   . mixed

d.enhancement:

YES   NO

e.cervix:

normal   abnormal

f.vagina:

normal   abnormal

g.urinary bladder:

normal mass   wall invasion

h.rectum:

normal   mass   wall invasion

i.bony pelvis:

normal   abnormal

j.lymph node enlargement:

YES   NO

k.acitis:

YES   NO

6.Histopatholoical finding: