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Rudimentary horn of a bicornuate uterus

Discussion of 16 cases, with a review of the literature

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Abstract : Four cases of pregnancy in a rudimentary horn with rupture and 11 cases of bicornuate uterus with non-canalized rudimentary horns personally discovered at laparotomy are described to substantiate the view that pregnancy is more likely to occur in a canalized rudimentary horn via its communicating channel with the well developed hemiuterus rather than by transperitoneal migration of either:

(*a*) spermatozoa through the normal uterine cavity, or

(*b*) a fertilized ovum from the contralateral ovary.

These cases have been selected from a collection of 322 cases of uterine abnormalities, the writer has detected during a period of 7 years from 1967 to 1974 in the Department of Obstetrics and Gynaecology at the Base Hospital, Kegalle.

All available literature in relation to this rare condition has been critically reviewed to evaluate the views and experience of various authors in dealing with the complications that may be met with in a rudimentary horn.

1. Introduction

Any disturbance in the orderly fusion of the Mullarian ducts during early embryological life (8—12 weeks of gestation) will eventuate in a uterine malformation, the degree of the resultant anomaly being dependent entirely on the time the causative agent exerts its influence (on the developing embryo). Thus if the development is arrested early, the uterus may remain rudimentary and in the extreme it may even be absent.

However, if unilateral faulty development following lack of fusion takes place, it would result in a uterus with one segment or one half well developed, while the other remains rudimentary or ill – developed. Further, the degree of development of the rudimentary horn would also vary from a horn slightly smaller than the normal to one so small and inconspicuous, that it could easily escape detection even at laparotomy. The cases described by Donald Duff[11] where it was missed at operation, subsequently to be diagnosed by microscopic examination of the specimen, (removed at autopsy), well illustrates this fact. Further, it could be adduced that the degree of response of the endometrium, and the muscular element to the stimulation of the hormones, and the enlarging pregnancy sac would be expected to vary with the stage of development of the horn. Therefore it is not surprising that most of the patients with this anomaly, unlike those with other types of uterine malformations,

go through their reproductive career without any complications to draw attention to its presence. This could also explain why there is such a paucity of cases of rudimentary horn associated with haemotometra, rupture in pregnancy etc. reported in the world literature.

2. Review of the Literature

The earliest description of a pregnancy in a rudimentary horn was by Mauriceau and Vassel in 1669, though Sänger was the first to publish a collection of such cases in 1883. In addition, Sänger[41] was the first to perform an amputation of the horn in a bicornuate uterus. Keherer[23] was able to collect 84 cases upto 1900. In 1911 Beckmann[3] reviewed 146 cases reported in the literature. Mulsow[31] stated in 1945, that with the aid of the librarian of Iowa State's Medical Library at Des Moines, he was able to review only 9 cases. Since Beckmann's review, from 1925 to 1950, Latto and Norman[26] found over 40 cases, while Howard Jones was able to collect 22 cases for a period of 10 years from 1950. From January 1960 up to June 1973 I have been able to collect only 38 cases of pregnancy reported in the Cumulative Index Medicus. Perhaps just over 300 cases have been reported in the world literature upto date. Yet a careful scrutiny of the cases reported would convince one that these reports have been infrequent and few and far between, most of such records being on single cases. Besides, this kind of anomaly being so exceedingly rare that it is very likely a practising gynaecologist, if fortunate, may see never more than one case in his career.

Perhaps, the reason for such, may be due to several factors:

(*a*) its rarity of occurrence ;

(*b*) the endometrium may be so refractile to hormonal influence that a haematometra would never develop ;

(*c*) that the rudimentary horn is so infantile and its cavity so minute and atretic that pregnancy could not occur even if transmigration of spermatazoa or the fertilised ovum is possible ;

(*d*) the Fallopian tube itself may partially or wholly be non-canalized ;

(*e*) it is also possible that there is no communication whatever between the rudimentary horn and the normal uterine cavity and that even a chance pregnancy via the normal uterus cannot occur. The hysterogram in most of these uteri would show a unicornuate appearance;

(*f*) or on the contrary the rudimentary horn may rarely be equally well developed with a wide patent communicating channel that spontaneous abortion could easily occur into the main cavity, to completely elude diagnosis (Gorgely [16].)

Therefore unless the discovery of a rudimentary horn has been by chance at an operation for e.g. ovarian cyst, pelvic mass, caesarean section, abdominal sterilization etc. the presence of a rudimentary horn may never be suspected, until the patient suffers from dysmenorrhoea associated with a haematometra or in the alternative, the rudimentary horn becomes the site of a gestation. Even if it were to be so, the diagnosis is invariably made at laparotomy (Rolen [39]) or at autopsy (Mulsow[31]).

Though rare, the most serious complication is a pregnancy in a rudimentary horn. In 1900 Keherer[23] found that in 78% of the 84 cases reviewed, the proximal end of the uterine horn did not communicate with the uterine cavity. Hence he affirmed that the pregnancy was possible only by external migration of either spermatazoa via the normal horn and fallopian tube or by the transperitoneal migration of the fertilized ovum from the opposite ovary. Although this may appear to be a rare phenomenon, it has been conclusively proved to occur as was observed in the cases reported by Duff[11] and Noor.[34] Further evidence as proof of transmigration could be cited (i) the case reported by Taber[43] where an ectopic gestation was present in a rudimentary fallopian tube, not at all connected to the uterus unicollis ; (ii) where a gestation was found in a tube conserved at hysterectomy of a rudimentary horn, the fertilization being possible by the passage of spermatozoa via the normal uterus.[39]

Besides, where the uterus is retroverted with the tube and ovaries prolapsed, the infundibular ends of the two fallopian tubes may lie adjacent to each other and in very close proximity, in the pouch of Douglas. Hartman[18] is of the opinion that movements of the viscera may move the spermatozoa about until chance brings it in to contact with the infundibulum of the fallopian tube of the rudimentary horn.

Though pregnancy in a rudimentary horn by transmigration is, no doubt, a possibility, Latto and Norman[26] consider that migration of the sperms via its communication with the normal uterine horn, to be more likely. Further, they argue that the rudimentary horn is not occluded until after pregnancy for the following reasons :—

(1) That as a large number of sperms are required for fertilization of the ovum it is unlikely that a sufficient number could find their way across the peritoneal cavity ;

(2) Corpus luteum is often found on the same side ;

(3) One may detect canalization of the distal end of the rudimentary horn into the uterus as illustrated by Munro Kerr and Chassar Moir[8] where the canal was easily demonstrated.

(4) Microscopic examination is always made after pregnancy occurs. Thus the canal would have been easily occluded by the tissue reaction to the advancing syncitium and the fibrin laid down due to small haemorrhages, as found in a lesser degree in a fallopian tube with an ectopic gestation.

(5) Since the incidence of rudimentary horn is not so rare and presuming that about 80% do not communicate, much more cases of haematometra should be seen. Of course it has been suggested that the endometrium in a rudimentary horn may be infantile and refractile to hormonal influence.

Johanson[21] in reviewing the literature says that " while a communication is now assumed in most cases, it is either inconspicuous or becomes obscured in early pregnancy by decidual growth". Of the four cases described by Shoukri[42] in three the cavity of the conjoined horn was found to communicate with the main horn. Jones[22] described a case of a ruptured horn where though the canal was not visualized macroscopically, a minute canal was detected at histology.

While accepting the fact that occasionally as a result of transmigration of spermatozoa, or a fertilised ovum a pregnancy could occur in a rudimentary horn, the majority of the current authors appear to favour the view that pregnancy is more likely from migration of the spermatozoa via its communicating channel with the normal uterine horn. Subsequently, the channel may become occluded due to the decidual changes and may not be visualized at the time of operation.

2.1 Outcome of Pregnancy in a Rudimentary Horn.

2.1.1 *Rupture of horn.*

Nevertheless, it is of paramount importance to appreciate the fact that once a rudimentary horn becomes the site of a gestation, unlike in other uterine malformations, it is potentially incapable of effecting delivery of the foetus via the natural passages. Furthermore the weak and ill developed myometrium will markedly limit the uterine growth and its distensibility. As pointed out by Miller[9] an additional disadvantage is that the cervical portion of such a malformed uterus is largely fibrous and is incapable of adjustment to increased internal pressure.

Hence the inevitable outcome of the majority of such cases is rupture of the horn, causing severe and profuse intra-peritoneal haemorrhage which may result in death, if surgery is not prompt. Keherer estimates rupture to occur in 47% of cases, Werth[40] 45%, Norman and Latto at 90%. The time of rupture would entirely depend on the stage of development of the rudimentary horn, the more rudimentary the horn is, the less resistance it will offer to the penetration of the trophoblastic tissue. Further, the distention of the uterine muscle would also be markedly limited. Although rupture of a rudimentary horn occured as early as the 5th week of gestation, in the case reported by Duff, generally rupture is seen to occur after

the 8—10th week (Chassar Moir). Sänger in 1883 was the first to emphasise the fact that the natural course of pregnancy was rupture of the rudimentary horn at the fourth month. Latto and Norman in their more recent review, stress the fact that unlike in tubal gestation where 50% rupture, 90% of rudimentary horn pregnancies rupture at the 16th week. Rolen in his analysis of 65 cases, concludes that, although the earliest recorded rupture was at the 10th week, and the latest at 38th week, the average duration of pregnancy in the rudimentary horn before rupture is 21.5 weeks.

Diddle[10] is of the opinion that if early, the rupture closely simulates an ectopic pregnancy in the interstitial portion of the fallopian tube and if late, a ruptured uterus. In either cases the patient's life is in jeopardy due to rapid and profuse loss of blood. Hence in an analysis made on rupture of the rudimentary horn during the first four months, Sänger[41] noted a maternal mortality of 87%, Keherer[23] 47.6.%, while Beckmann[3] 5.5%, De Nicola and Peterson[9] stated that 90% died in 15 minutes. In recent times, due to better diagnostic acumen, advanced resusitative measures, skilled surgery and modern anaesthesia, mortality has been reduced considerably. Nevertheless, most of the authorities are of the opinion that unless immediate surgery is available with adequate blood for replacement therapy, death may ensue in about 90% within a short period, as was evident in the case reported by Mulsow,[31] where the patient died within 15 minutes. Yet in most of the cases reported in recent times, the history clearly indicates that, prior to the onset of this "catastrophic episode", many of them suffered for some time from abdominal pain, sometimes "cramp" like, general weakness, dizzness with or without syncope, and vaginal bleeding, as in the case of other extra uterine pregnancies. These symptoms, perhaps, would be attributable to a partial rupture as was evident in the case reported by Gorden,[15] where the patient suffered from crampy abdominal pain, vomiting and fainting for 48 hours prior to admission. Occasionally the patient may have passed a decidual cast from the normal horn.[25] A rare outcome after rupture of a rudimentary horn is well illustrated by a case presented by Lewis.[27] This patient had developed abdominal pain without bleeding at 14 weeks. Subsequently a dead foetus was delivered at term, by laparotomy for a secondary abdominal pregnancy. 11 months later, the placenta still situated in the cavity of the rudimentary horn which was found to have no communication with the vagina, was removed by surgery.

Nagen Gosh[32] reported a remarkable case in 1966 where the patient had survived about eight weeks after the rupture of the rudimentary horn at the 35th week of pregnancy. She had been admitted with a history of a "diffuse abdominal pain, which had become intense and periodic during the preceding 24 hours." Fundus of the uterus corresponded to 34 weeks. "Uterus was tense and part of the foetus was palpated"; but foetal movements were absent. Having

failed five attempts at medical induction and a further attempt with intra-amniotic installation of saline with no success, a laparotomy was performed three weeks after term. This revealed "a pregnancy of a ruptured rudimentary uterine horn with a microscopic communication with open horn."

2.1.2 *Missed Abortion*

Of the balance 10% most of them terminate as missed abortions. This could be attributed to the poor blood supply and to the limited uterine distension available to the advancing pregnancy. Further, the absence of a communicating channel makes it mechanically impossible for the expulsion of the gestation sac. Thus with the death of the embryo it will be retained as a missed abortion. The most serious complication though met with rarely, is infection of the pregnancy sac. Occasionally the pregnant rudimentary horn may undergo torsion or if pregnancy is retained for several years it is likely to obstruct the progress of labour in subsequent pregnancies occurring in the normal horn. One of the rare causes of obstruction to the progress of the foetus from the rudimentary horn though well developed is the angulated pedicle as reported by Rademaker.[36] . The case reported by Nokes[33] is of particular interest that two attempts to remove a dead foetus at five months through the cervix resulted in failure. The true condition of a pregnancy in a rudimentary horn was discovered at laparotomy only about two months later, when she was admitted with a lump in the hypogestrium. Gorgely[16], Wahlen[45] also record similar cases of missed abortion in a rudimentary horn where a laparotomy was done, after several unsuccessful attempts at induction.

2.1.3 *Complications in Pregnancies Advancing to Term.*

However, a few cases in this group have been reported to have proceeded to term. Koplowitz[24] records a case where the patient was admitted apparently in labour with the fundus of the uterus 2 inches below the ensiform with foetal death. Radiological examination confirmed the maturity of the foetus to be between 32—34 weeks. The other cases reported are by Robinson[38] where rupture occurred at 38 weeks; Rutherford[40] a full term pregnancy three weeks overdue ; Mac-Caffrey[28] a " missed labour" as a result of a retention of a foetus near term. Mac-Caffrey in his review of 19 cases where the foetus advanced to past term pregnancies, included case reports by :

(1) Menzis — foetus retained for 280 days after term.
(2) Henning — foetus retained for 210 days after term.
(3) Lichtward — foetus retained for 26 months after term.
(4) Potter — foetus retained for 2 months after term,
(5) Kotz — foetus retained for 8 years after term.
(6) Potter — foetus retained for 12 years after term.

The longest recorded cases of retention of a foetus in a rudimentary horn is that recorded by Scott and Forman[15] where at operation for a mass present for 20 years, bones of twins were detected in the rudimentary horn. It is interesting to note that during this interim period, she has had two normal deliveries 3 miscarriages, shortly after this pregnancy and another baby nine years later all from the normal uterine horn. Of the cases reviewed by Mulsow, four went to term. A careful review of those patients who either terminated as missed abortions or advanced to late pregnancy shows that the diagnosis had been very elusive. Often several attempts at induction of labour, medical and surgical, had been made without any success. The case reported by Noor[34] is of interest in that the two attempts at vaginal evacuation of a conceptus for psychiatric reasons had failed. At the second attempt a pelvic mass the size of a foetal head was detected, lying separate from the uterine cavity. Foetal bones were seen in X-ray examination. Yet the observation that clinched the diagnosis, was the fact that an intravenous injection of oxytocin administered at vaginal examination, produced an adequate palpable contraction of the tumour mass.

The most important and significant observation that could be made on all these cases, unlike in a ruptured horn, is that, even though the conceptus had been retained for several years, it did not at any stage jeopardise the life of the patient. However it has been noted that in those instances where the dead foetus was retained for sometime, considerable surgical difficulty was experienced at removal due to extensive adhesions to bowel, etc. In fact Rutherford reported a case where due to sepsis, the pregnancy sac was so adherent to bowel, etc. that he was able to remove only a small piece of the pregnant rudimentary horn along with the non-parous uterus.

Lahmann[25] reported a case of twins in a rudimentary horn, where labour was induced unsuccessfully, for foetal death. Surgical induction had failed as the Allis forceps could not be introduced due to obstruction at the internal os. Diagnosis was then suspected as the Voorhees' bag introduced into the cervical canal had dilated the canal of the non-gravid empty uterus that was found separate from the foetal mass. At operation a twin pregnancy in a rudimentary horn attached to the right side of the main body of the uterus was found. The other important fact was that although a canal was not detected on probing a pedicle 3.5 cm long, its presence was revealed at microscopic examination.

2.1.4 *Secondary Abdominal Pregnancy*

The other possibility, though rare, is the resulting secondary abdominal pregnancy following a rupture of a rudimentary horn. In fact, Munro Kerr states that "I have little doubt that many a case of advanced abdominal pregnancy are in reality, cases of rudimentary horn gestations with the anatomical features obscured by haemorrhage and adhesions." Perhaps, in view of the difficulty in arriving at such a diagnosis, there have been no cases of abdominal pregnancies associated with ruptured rudimentary horns so far reported.

2.1.5 *Foetal Survival*

Although the maternal mortality has been markedly reduced (nowadays) the mortality of the foetus has remained almost at 100%. Inspite of the fact that several pregnancies had advanced to maturity, it appears that only a very few have been born alive. The recent case delivered by Caesarean section by Charles [6] is one of the few that survived, though unfortunately the infant had died on the 14th day after operation for a malrotation and volvulus. One other case is reported by Robinson[38] where after rupture at 38 weeks the child was rescued by an emergency laparotomy. The main reason for the foetal loss is the error in diagnosis as most of the pregnancies had been left alone in the hope of a successful vaginal delivery. Therefore in almost all such pregnancies though the foetus reached a stage of viability the mortality has been 100%.

3. Ruptured Horn in Pregnancy

Case Reports

The rarity of occurrence will be appreciated when it is mentioned that the author was able to collect only 10 cases of rupture of rudimentary horn in pregnancy, in the Cumulative Index Medicus during the past 13 years (1960—1972). Thus in view of the marked paucity of such reports in recent times, I consider it opportune to record the presenting symptoms and clinical findings in four cases of rupture personally met with (within a period of 4 years) along with another followed up during pregnancy subsequent to the rupture.

In addition, I propose to quote reference to 11 other cases of rudimentary horns discovered at operation e.g. laparotomy, abdominal sterilizations etc. and at hysterography to substantiate the view, that all these cases would have been missed under normal circumstances, as most of them had gone through their reproductive period without any complications referred to this anomaly.

3.1 Case I

Mrs. D. S. a 29 year old gravida 4, para 2 was admitted on 14.12.1969 at 8.30 a.m. with a history of acute abdominal pain since 2 p.m. of the 12th December, at the 16th week of gestation. Although the onset of the abdominal pain had been quite sudden, the pain had increased in severity and "cramp" like, only in the early hours of the morning of admission.

Her first pregnancy resulted in an abortion at 3 months while the next two had both terminated in term normal deliveries. Last child was $2\frac{1}{2}$ years old.

On admission the general condition was satisfactory. Blood pressure was 120/90 mm Hg.

Abdominal Examination—revealed a tender, rounded lump size of a 14—16 week pregnancy situated centrally in the hypogestrium 2'' above the symplysis pubis. Guarding and rigidity of the muscles and free fluid in peritoneal cavity were elicited.

Bimanual examination—revealed a soft cervix with the os closed. A "boggy." tender mass in the right anterior fornix was felt markedly displacing the bulky uterus towards the left pelvic wall, and continous with the abdominal lump. A ruptured ectopic gestation was diagnosed.

At laparotomy—The uterus was found to be bicornuate with a rupture at the cornual region of right horn. The foetus corresponding to about 14 weeks gestation was seen to be lying in the abdominal cavity but attached by the umbilical cord to the placenta, partly adherent to the cavity of the ruptured rudimentary horn. The round ligament was noted to arise from the lateral wall of the horn just below the site of the rupture. Both horns were observed to be enlarged, the right horn to about 10 weeks and left horn to about eight weeks gestation. The right horn was noted to arise from the body of the uterus as shown in Diagram 1.

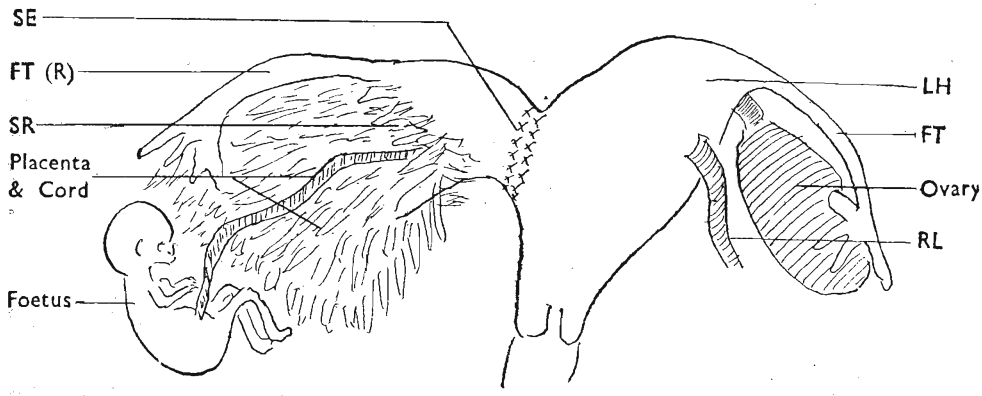


Diagram 1. Bicornuate uterus showing the ruptured horn on the right side prior to excision with placenta and foetus in peritoneal cavity.

SE — Site of excision of right horn : FT — Fallopian Tube
SR — Site of rupture ; LH — Left Horn ; RL — Round Ligament.

The right horn was excised proximal to its attachment along with its tube. Recovery was uneventful.

Intravenous pyelogram revealed no abnormality except for the impression on the upper surface of the bladder caused by the remaining left horn of the uterus.

Hysterogram No. 1—revealed a shadow of the left horn. (See Plate I)

Follow up—She has had a normal delivery on 1.6.71 (i.e. 17 months after operation).

3.2 Case 2

Mrs. R. H. a 28 year old gravida 3 para 2 was admitted to hospital on 4.3.71 at 2.50 a.m. with a complaint of severe abdominal pain of one day's duration at the 9th week of gestation.

Significant features in her obstetric history were that her first pregnancy was a breech delivery and the 2nd resulted in manual removal of the placenta $2\frac{1}{2}$ years ago.

On admission there was marked pallor. She was restless and in pain. Pulse rate was 72 per minute. Blood pressure was 80/60 mm Hg.

Abdominal pain and tenderness were generalised. Peristalisis was sluggish. Shifting dullness was easily elicited.

Pelvic Examination—revealed a bulky retroverted uterus with acute tenderness in all fornices. The pain was aggravated on rocking of cervix. Cervix was soft. Os was closed. There was no evidence of bleeding per vaginam.

A ruptured ectopic gestation was diagnosed.

At operation—a rupture of the cornu in a rudimentary horn of a bicornuate uterus was detected. The foetus within the intact amniotic sac along with the placenta was found lying in the peritoneal cavity. There were about 2—3 pints of blood in the abdomen. The left cornu of the uterus was enlarged to about 6—8 weeks, of gestation. The right horn with its fallopian tube was excised. Recovery was smooth.

Intravenous Pyelogram—Kidneys excrete well.

Bladder—small impression on the left side of fundus of bladder, probably due to the uterus.

Hysterogram No. 2—Left uterine cavity with extension into the right uterine cavity seen. (See Plate II)

3.3 Case 3

Mrs. D. W. J. para 3 gravida 2 was admitted on 21.7.69 at 1.25p.m. with a complaint of acute abdominal pain and difficulty in breathing of 7 days duration. She had no periods since partus $1\frac{1}{2}$ years ago. Her two previous pregnancies had been normal.

Though the abdominal pain had been quite sudden in onset and initially felt around the umbilicus, the pain had remained as a dull ache mostly confined to the lower abdomen. She had vomited a few times, but as the pain had become severe in the morning, with even normal respiration being painful and difficult, she had decided to seek admission.

On admission—she was pale and waxy. She appeared to be very ill. Pulse was 160/ per minute. Blood pressure was 80/60 mm Hg. She was in an advanced state of shock and collapse. There was free fluid in the peritoneal cavity.

Vaginal Examination—revealed the uterus to be enlarged to about 10 weeks. All fornices were acutely tender. Rocking of cervix caused excruciating pain. There was no bleeding per vaginam.

Diagnosis of a ruptured ectopic gestation was made.

On opening the abdominal cavity, bleeding from a ruptured right horn of a bicornuate uterus was noted. In addition a foetus of about 16 weeks gestation together with its placenta, was observed lying free in the peritoneal cavity. The left horn appeared to be larger than the right and corresponded to about 16 week pregnancy. Thus it was evident that this was a case of twin pregnancy ; with one in the normal horn and the other in the ill developed horn, that had ruptured, not being able to contain the enlarging preganancy sac.

On the 3rd day after operation the patient developed bleeding per vaginam with lower abdominal pain, resulting in the expulsion of the 2nd foetus (from the left horn) lying in its amniotic sac with the placenta entire. She left hospital after intravenous pyelography but did not report for hysterography.

Intravenous Pyelography—Left kidney shows a vascular impression on upper major calyx. No other abnormalities seen.

Right kidney normal.

Bladder shows a deep midline impression on the fundus, due to the uterus.

3.4 Case 4

Mrs. N. R. P. a 28 year old gravida 4 para 3 was admitted on 25.5.70 with a history of severe lower abdominal pain, vomiting and dysuria of five days duration. Her last menstrual period was on 8.3.70. There was no bleeding per vaginam.

Previous pregnancies had all terminated in normal deliveries. Her last child was 1 year and 3 months.

On admission she was in a state of shock with clinical evidence of acute internal haemorrhage. She complained of referred shoulder pain.

Abdominal examination—abdomen was acutely tender with guarding and rigidity.

There was an indefinite, elongated oval lump in the right iliac fossa which was very tender. In view of the acute abdominal tenderness and marked degree of collapse a bimanual examination was dispensed with, and immediate operation undertaken, for a ruptured ectopic gestation. However in view of the advanced state of shock, collapse and pallor the diagnosis of a ruptured horn was considered more probable.

The uterus was found to be bicornuate. A posterior wall rupture at the cornu of the gravid right rudimentary horn with the foetus of about 8 to 10 weeks size lying free in the peritonial cavity was identified. The left horn too was enlarged to about 10 to 12 weeks, felt cystic suggestive of another gestation. Right round ligament was attached to the lateral wall of the ruptured horn.

The right horn was excised proximal to its attachment to the uterine body but safely away from the main cavity The uterine wound was sutured to ensure good haemostasis. The left ovary was observed to contain a corpus luteum. Right ovary appeared normal.

On discharge the fundus was palpated about 2'' above symphysis pubis corresponding to the period of amenorrhoea of 13 1/7 weeks.

Pregnancy in the left horn progressed satisfactorily to terminate in a normal delivery 10 days before term. This was followed by another term normal delivery. In both instances the uterine scar did not cause any concern.

An abdominal sterilization was done on the 6th day after partus. But for a few "flimsy adhesions" to indicate the site of the operation the scar was hardly evident.

Intravenous Pyelography—normal.

Hysterogram No. 3—appearance of uterine cavity is that of a single cornu.
(See Plate II)

3.5 Case 5

Mrs. P. M.—a 28 year old gravida 2 para 0 was referred for admission from the antenatal clinic, on 11.2.72 for delivery as she complained of painful uterine contractions. She was in her 39th week of gestation. She had been married for 15 years.

Since the outcome of the 1st pregnancy is relevant to the subject under review, it is dealt with in detail. She had conceived after two years of marriage. She had been admitted with acute abdominal pain at the 10th week of gestation in December, 1959. At laparotomy a cornual rupture had been detected in an ill-developed right horn of a bicornuate uterus. A 5 cm size foetus was found free in the peritoneal cavity. The right horn had been excised.

On admission—the fundus of the uterus was enlarged to about 32 weeks of gestation, and was felt to be "flattened." The foetal limbs were palpated in the left cornu overlying the left flank. Head was at brim with the back on the right side. The size of the foetus appeared to be much smaller than the period of amenorrhoea. The patient herself had doubts about her last menstrual period. Therefore it was decided to await spontaneous labour. Labour set in at 41 3/7 weeks.

In view of the long period of subfertility and as the progress of labour was not satisfactory, the pregnancy was terminated in early first stage, by a lower segment Caesarean section.

At operation, uterine outline at the fundus appeared to be bi-cornuate with the left horn being more markedly enlarged than the right side. Right horn was blunt and very shallow. The foetus was entirely confined to the left side with the limbs in the left cornu. Head was at brim.

The weight of the baby was 3 lbs 10 ozs.

The right tube was absent. There were few ommental adhesion to the right cornu indicating the site of the operation. The old scar was intact.

Recovery was smooth.

Intravenous Pyelogram—No changes seen.

Hysterogram No. 4—Left side uterine cavity appears to be normal. (See Plate IV)

Amputation of right horn visualized. There is venous intravasation.

4. Discussion

When the case histories reported of pregnancy in a rudimentary horn are studied in detail it could be concluded that diagnosis in 92% (42 of 52 cases reviewed) has been incorrect. Abnormal shapes and contours of the fundus of the uterus associated with abnormal disposition and lie of the foetus during the antenatal period have been described by Falls[12] and Hay[20] and to aid in the diagnosis of other major uterine malformations. However, no such observations have been made possible in the case of a pregnancy in a rudimentary horn. This is mainly due to the varied symptomatology presented by them. In addition the number of cases met with by any indivudual were so small that no conclusive criteria were arrived at. Hence one could well comprehend the reason for this lapse in diagnosis.

In every case that seek admission, the general clinical picture is that of a sudden and rapid intra-abdominal haemorrhage resembling the "fulminating" type of extra uterine pregnancy. De Nicola and Peterson[9] emphazise that "considering these cases it is fortunate that most incorrect diagnosis made (tubal gestation) necessitates immediate surgery. Since the abnormal uterus cannot fulfil a reproductive function, the diagnosis of an ectopic pregnancy is practically speaking a correct one." Thus in the majority of cases reported the diagnosis had been a ruptured ectopic gestation. No doubt a few authors like Bland—Sutton,[4,44] Targett and Gordon[15] had diagnosed the condition quite accurately prior to operation. In my view this is only possible in the case of a rudimentary horn with a long pedicle, where the

pregnancy horn is felt quite apart and separate from the non-gravid horn. But when the pedicle is short or the uterine horn is partially fused, closely resembling a bicornuate uterus, the diagnosis could easily be missed. In a few instances as recorded by Bannister[2] and Noor,[34] laparotomy had been done prior to rupture, though the diagnosis had been incorrect.

In addition, in a recent review Wahlen[45] describes two cases of pregnancy in a non-communicating rudimentary horn at the fourth and fifth months respectively, where laparotomy was performed for an ovarian cyst, complicating pregnancy. In both instances, the pregnancy was discovered in the intact rudimentary horn which had simulated a tumour. Thus all the five cases of ruptured horns in this series, were diagnosed as extra uterine gestations, although in case No. 4 the possibility of a ruptured horn was considered more likely in view of the advanced state of collapse.

Several authors have stressed the fact that rupture of a pregnant horn as a serious catastrophe, where unless immediate surgical attention is instituted, may result in death in a short time. Nevertheless it is surprising to note that, of the four cases out of the five discussed earlier, the patient had survived the initial episode of intra-peritoneal bleeding for a variable length of time ; varying from 1 to 7 days prior to admission to hospital. Thus these cases closely resemble a "slow leaking" type of ectopic gestation as described by Gordon.[15] This "slow leak" may result from a gradual eroding of the thinned out wall of the ill-developed atretic horn by the perforating trophoblastic tissue. Perhaps, advanced resuscitative measures, whole blood replacement and prompt surgery may have undoubtedly, contributed to the survival of these patients. In view of these observations it could be concluded that no clear and definite criteria could be laid down for the diagnosis of a pregnancy in a rudimentary horn.

At laparotomy, the most important finding to differentiate a horn pregnancy from an extra uterine rupture is the presence of the round ligament "running into the wall of the gestation sac." (Chassar Moir).

In the group of patients who had a rudimentary horn ruptured, the most interesting and rare coincidence, was the occurrence of twin pregnancies in two of them. In the first (case 3) the rudimentary horn ruptured at the 16th week. The other horn which was correspondingly enlarged aborted the 2nd foetus on the third post operative day, probably due to trauma and severe hypoxia associated with hypotension and profuse intra-peritoneal haemorrhage.

The other patient illustrated the unique phenomenon, when the smaller ill developed horn ruptured at 12 weeks necessitating a hemihysterectomy, the other horn carried the second foetus without any untoward symptoms, to eventually terminate in a normal term delivery (Case 4). Thus adding further support to prove the integrity of the scar, even though, the incision was made at the fundus of a uterus which continued to enlarge with the advancing pregnancy.

TABLE DESCRIBING 11 CASES OF RUDIMENTARY HORN WITH DETAILS

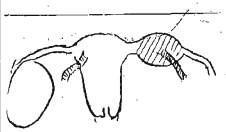
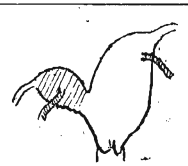
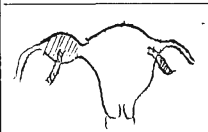
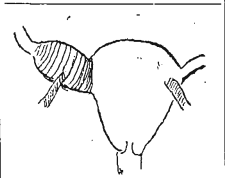
No.	*Name, Age & Obs. History*	*Time of Diagnosis*	*Findings at Laparotomy.*	*Diagram*	*Hysterogram*	*I.V.P*
I.	T.D.D.—41 Years. P_1—P_{10} N.D.	At abdominal sterilization.	Bicornuate uterus Rudimentary Horn (R) side. Fall. Tubes Normal		UNICORNUATE No. 5	No congenital deformity seen.
II.	W.K.—25 yrs. P_1—abortion 4/12 No living children.	At laparatomy for (R) ovarian cyst.	(R) Ovarian cyst Bicornuate uterus Rud. Horn (L)		UNICORNUATE No. 6	N.A.D.
III.	S.D.N.—37 yrs. P_1—Breach (LSCS) Placenta Praevia P_2—Hyd. Mole P_3—Breach Oblique lie (LSCS)	At C.S. P_3	Bicornuate uterus (L) Rud. Horn $1\frac{1}{2}''$ arising from short stump 2'' long.		UNICORNUATE No. 7	N.A.D.
IV.	S. 38 yrs. P_1—P_7 N.D. L.C. $2\ \frac{10}{12}$ yrs. P_8—P_8—P.O.A. $11\ \frac{4}{7}$ weeks.	Laparotomy for Ovarian cyst complicating pregnancy.	Bicornuate uterus (R) Rud. Horn with (R) Hydrosalpinx. (L) Uterus Pregnant 10—12 weeks.		UNICORNUATE No. 8	Not done.
V.	N.P.S.—26 yrs. P_1—P_4 N.D.	Abdominal sterlization.	Bicornuate Rud. Horn (R)		UNICORNUATE No. 9	Not done.
VI.	K.W.—28 yrs. P_1—Breech Cord Prolapse L.S.C.S.	At L.S.C.S.	Bicornuate uterus Rud. Horn (R) Non communicating Tubes. N.		Large Unicornuate uterus. Partial uterus. Extension in to the Rud. Horn. No. 10.	N.A.D.

TABLE DESCRIBING 11 CASES OF RUDIMENTARY HORN WITH DETAILS

No.	*Name, Age & Obs. History.*	*Time of Diagnosis*	*Finding at Laparotomy.*	*Diagnosis*	*Hysterogram.*	*I.V.P.*
VII.	A.R.M.T.—37 yrs. P_1—P_4—N.D. P_5—$2\frac{1}{2}$) All P_6—$1\frac{1}{2}$) abor- P_7—$1\frac{1}{2}$) tions. P_8—1152	At Hysterography for repeated abortions.	—	—	Bicornuate uterus ill developed (L) Horn. No. 11	Left Kidney larger than (R)
VIII.	U.A.—45 yrs. P_1—P_3—N.D. P_4—Breech.	At Hysterography for suspected uterine defect at Antenatal Examination.	—	—	Bicornuate uterus (L) ill developed horn. No. 12	Not done
IX.	K.L.P.— P_1—P_4—N.D.	Abdominal Sterilization	Bicornuate uterus (R) Rud. Horn. Tube shorter than (L)		Unicornuate uterus No 13	Not done.
X.	S.R.H. P_7—C_7—All N.D.	Abdominal Sterilization. Narrow short tube.	Bicornuate uterus Rud. Horn (R)		Unicornuate uterus. No. 14	Not done.
XI.	S.K.—24 yrs P_1—P_4—N.D.	At Abdominal Sterilization.	Bicornuate uterus Rud. Horn (R) ($1\frac{1}{2}'' \times \frac{1}{2}''$) Both tubes equal size.		Unicornuate No. 15	

Piquand[35] expressed the view that a canal was present only in 15% of cases, and it is only observed when the uteri approach the bicornis unicollis. The five cases of rupture described, appear to approximate this type of uterus.

Further it was evident in 8 of the 11 cases listed, though these patients had a total of 41 pregnancies among them, they were solely confined to the normal well developed hemiuterus apparently due to the fact that there was no canal communicating with the main uterine cavity. These uteri resembled the unicornuate uterus at hysterography. In the balance three, one showed a small blind extension of the main cavity into the proximal portion of the rudimentary horn (No. VI) while the other two showed smaller ill-developed horns. (Nos. VII—VIII). It is of interest to mention that in Case No. VII the patient having had four normal deliveries at term followed up, with four consecutive abortions between 6 to 11 weeks. Perhaps it is very likely that the pregnancy sac which implanted in the rudimentary horn aborted unobtrusively via the main cavity as the communicating channel was wide enough to extrude the products. As referred to earlier this case would have been missed had not a hysterogram been done to investigate the patient for recurrent abortions. It may also be concluded that haematometra never developed in these uteri (Nos I—VI and IX—XI) as the rudimentary horn was ill-developed and non-reactive to hormonal stimulation. Apparently no pregnancies were possible in the rudimentary horn due to the absence of the communicating channel although the fallopian tube appeared to be normal and healthy.

Therefore, considering the pattern of behaviour of all these cases in this series, I would affirm that majority of the pregnancies in the rudimentary horn would occur in uteri that approach the bicornis unicollis type, as they always possess a communicating channel (refer hysterogram Case No. 2). This would also confirm the present view that in most of these horns that are the seat of gestation, pregnancy could have been possible via the main uterine cavity rather than by a process of trans-peritoneal migration of spermatazoa or the fertilized ovum.

The incidence of genito-urinary tract abnormalities associated with gross uterine malformations appear to have been exaggerated. Yet in the series analysed by Rolen, 12 out of the 15 cases investigated, had renal aegenesis on the abnormal side while another two had a pelvic kidney. This high incidence was not reflected in the present series, as 8 of 12 cases subjected to intravenous pyelography were normal. In one of the above, left kidney (functionally normal) was larger than the right, although ill-developed horn was on the right (Case 7).

5. Conclusions

(1) Hysterogram findings of case 2 clearly shows the remaining narrow portion of the communicating channel after hemihysterectomy.

(2) Unique coincidence of two cases where the two horns were the seat of twin pregnancies are discussed. In one patient the pregnancy in the contralateral horn, aborted while in the other, it went to term.

(3) The other characteristic feature was that there was no bleeding per vaginam though normally described to occur, following the disturbances of the pregnancy.

(4) The most significant feature in all the 4 cases of rupture was that the patient had survived the initial episode for several days.

(5) The average period of amenorrhoea was 11 weeks and 5 days.

(6) Though the external contour of the uterus was described by Shoukri to resemble a subseptate, my observation was that they show a bicornuate appearance with the well developed horn enlarged to the normal size uterus while the small ill-developed horn was attached to it like a subserous fibroid with a thick pedicle (Fig. I—XI).

(7) It has been my observation that in 9 out of 11, the fallopian tube on the side of the rudimentary horn and the normal horn were about the same length and size. The other two had a short stumpy fallopian tube attached to the cornu of the rudimentary horn. This appears to be contrary to the view expressed by Munro Kerr.[7]

(8) The other observation was the finding of a sympathetic enlargement of the contralateral non-pregnant horn due to the presence of the pregnancy in the other.

(9) Incidence of genito—urinary tract abnormalities associated with uterine malformations appear to have been exaggerated in some of the reports.

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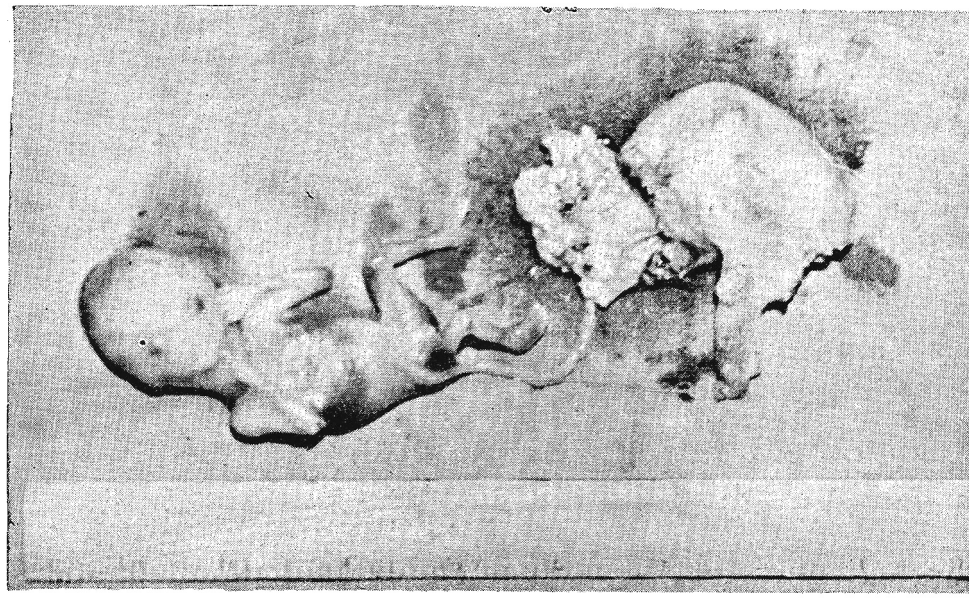
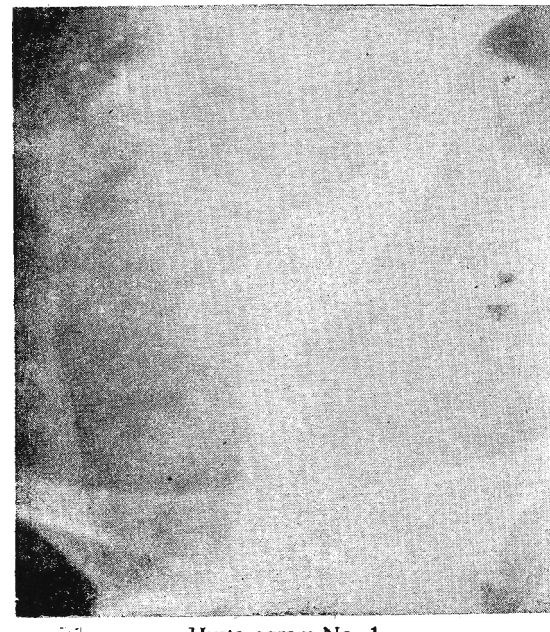


Photograph No. 1 — excised right horn and foetus with the placenta.



Hysterogram No. 1

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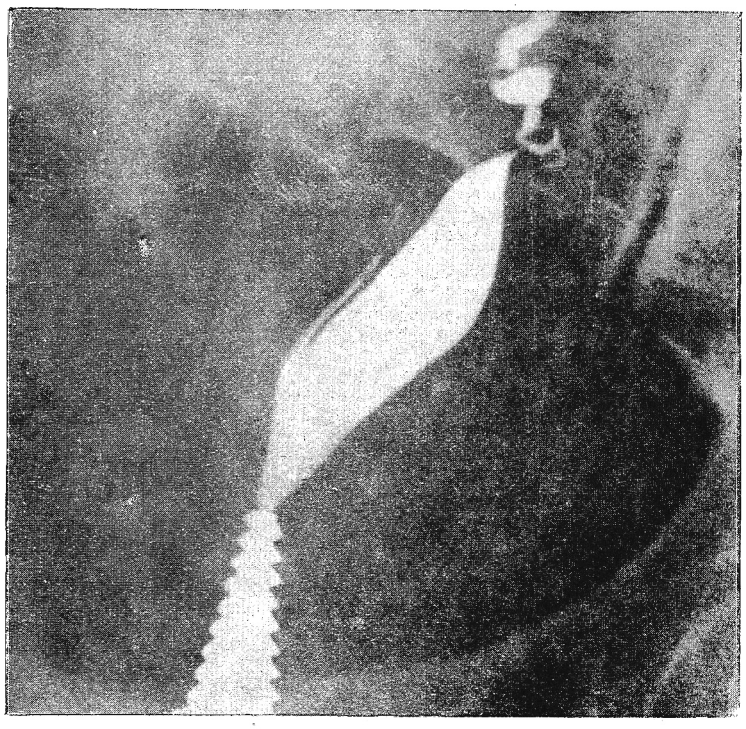

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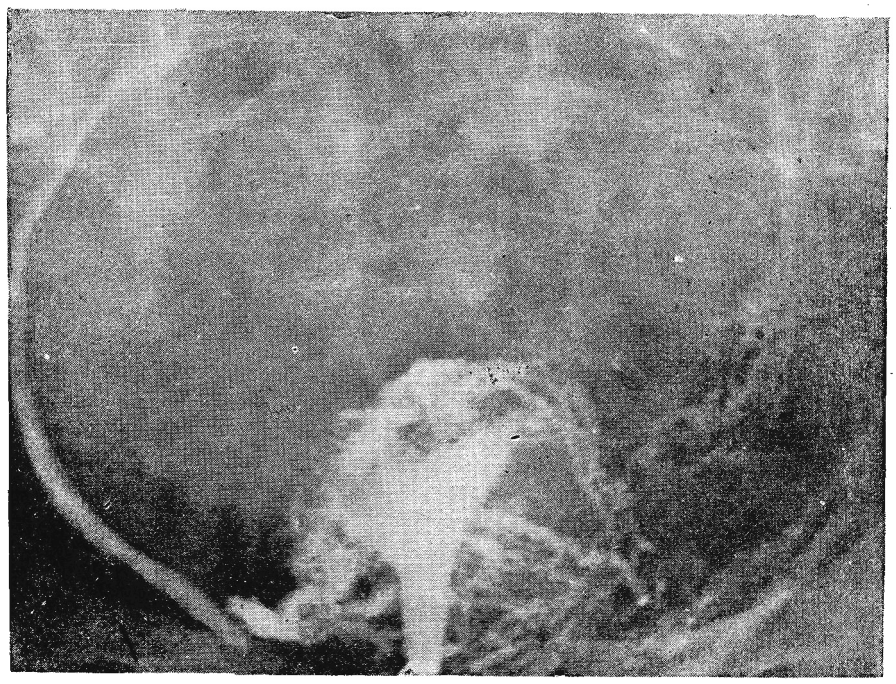

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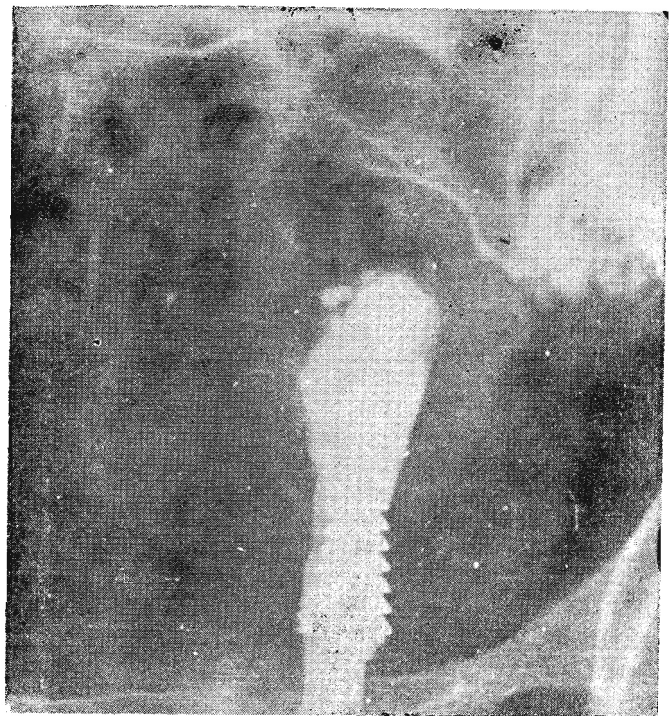

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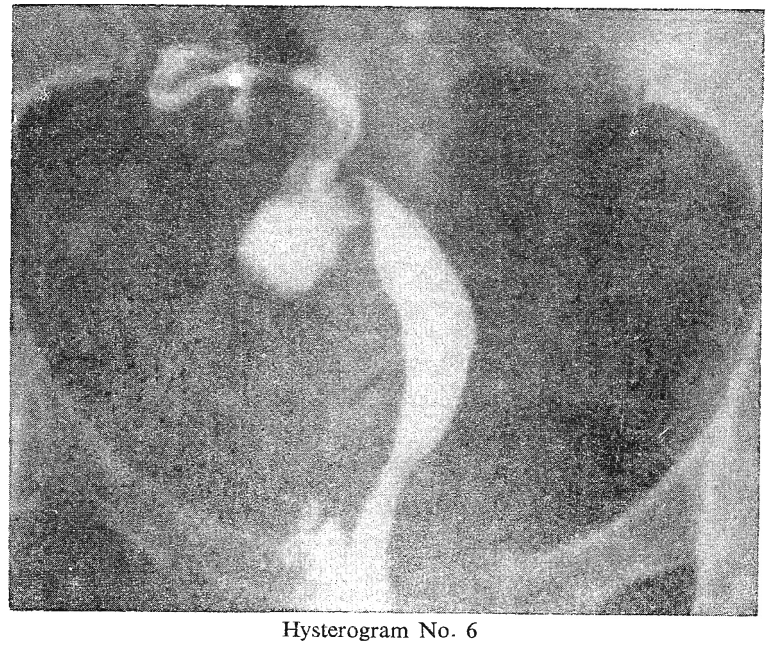

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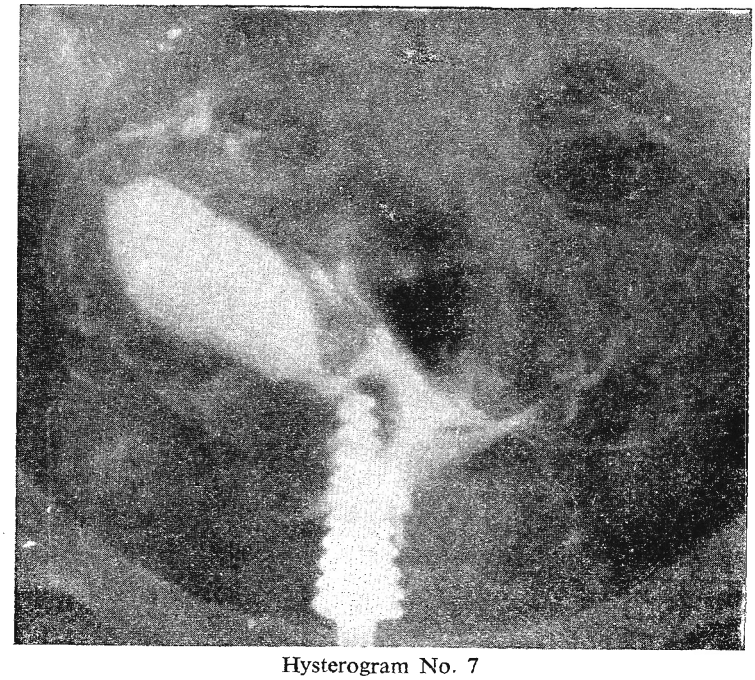

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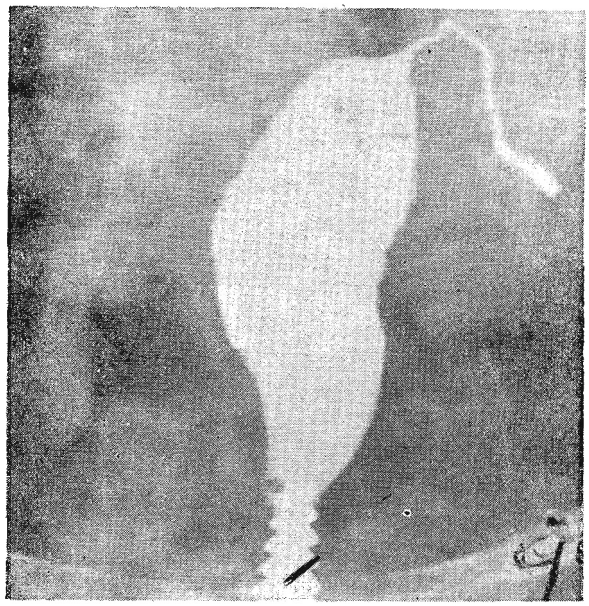

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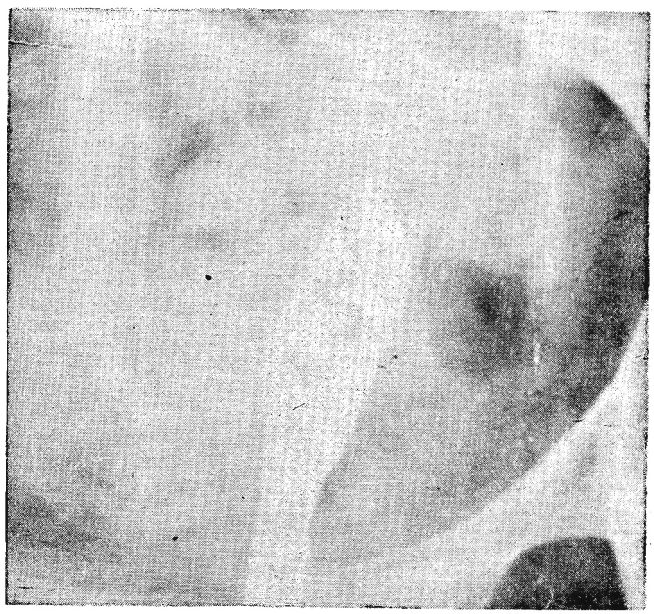

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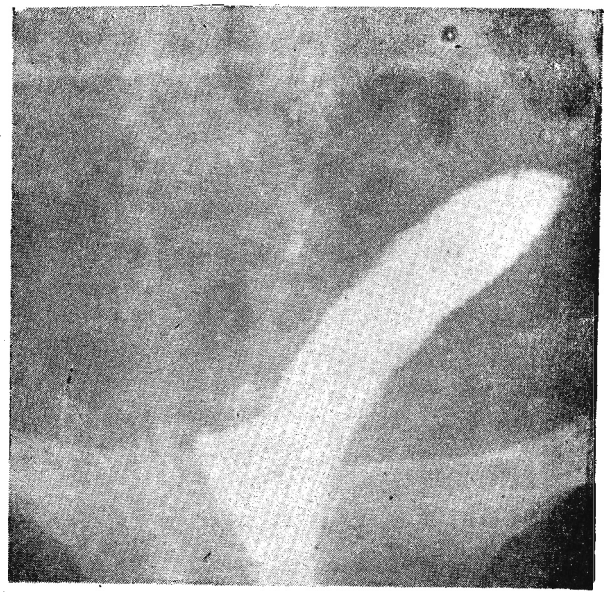

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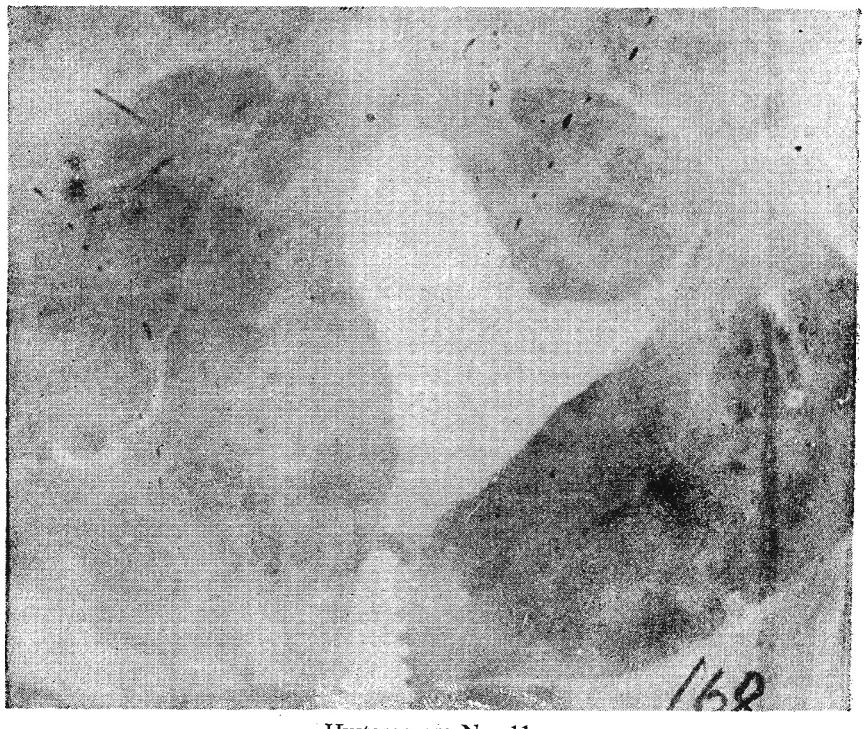

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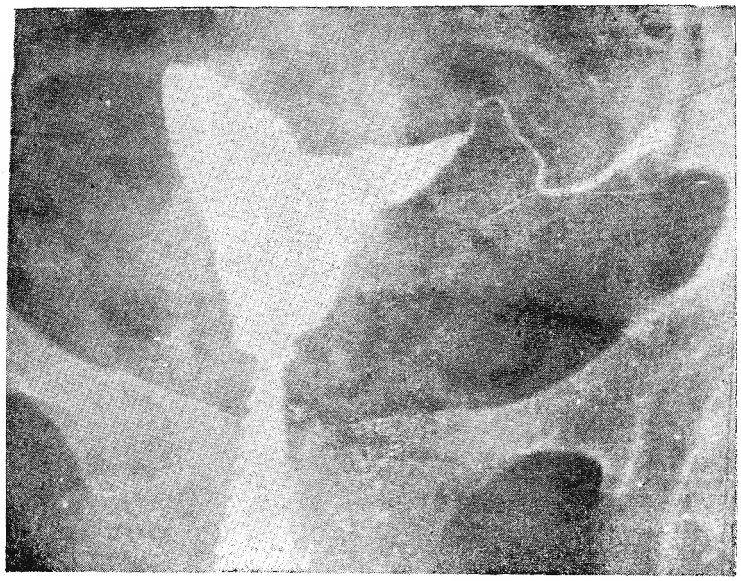

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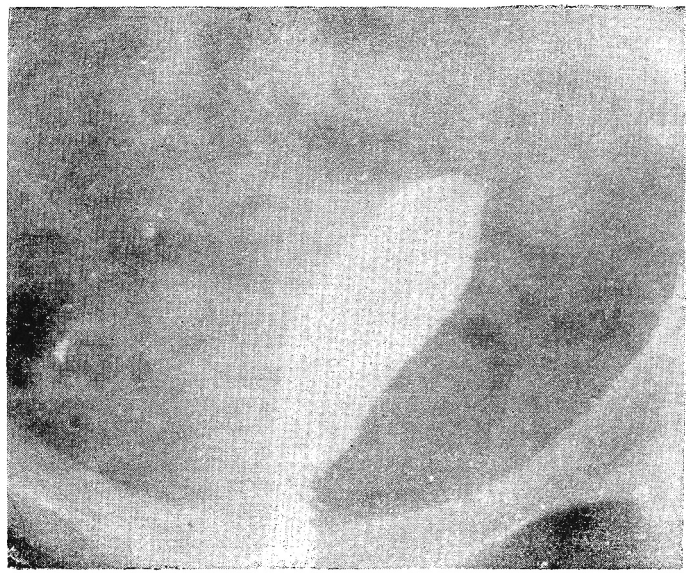

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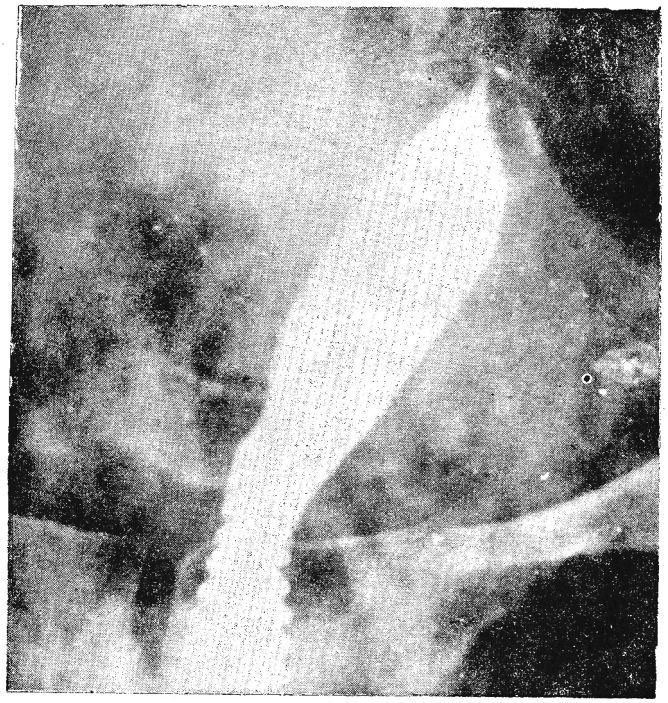

Hysterogram No. 14

Hysterogram No. 15