

IMPERFORATE HYMEN: WITH AND WITHOUT HEMATOCOLPOS*

A REVIEW OF THE LITERATURE AND A REPORT OF TWENTY CASES

JAMES C. DOYLE, M. D.
Beverly Hills

RECENTLY a thirteen and one-half year old girl who had never menstruated was observed for appendicitis. She had complained of listlessness, fatigue, lower abdominal cramps, nausea and vomiting for over six months. She was subjected to a bilateral salpingo-oophorectomy for ovarian blood cysts. In four months all her symptoms returned and a hysterectomy was performed, in spite of a normal-appearing uterus. During the hysterectomy the vagina was opened; and considerable thick, chocolate-colored material was encountered. The appendix was then removed and vulvar inspection revealed an imperforate hymen. As improbable as this case may seem, there are others where true diagnosis was established by perineal inspection only after unnecessary abdominal surgery.

ETIOLOGY

The pathogenesis in most instances is explained on a congenital basis. Williams¹ referred to the embryological researches of Nagel, confirmed by Gellhorn, "that the hymen represents the lowest portion of the vagina," adding further: "In early embryos the hymen is composed of a solid mass of epithelial cells, and after proliferating rapidly for a time, those most centrally-situated begin to degenerate, so that a lumen is produced." Imperforate hymen results from the persistence of these central cells. Other possibilities suggested by Davis² are infection in intrauterine life, or an excessive proliferation and coalescence of the area just back of the septum, rather than its failure to regress. Pediatricians are familiar with a closely-allied condition wherein there is an agglutination of the labia from infection or uncleanness. Congenital retrohymeneal atresia, reported by Hiraga,³ and Jurgens and Damianovich,⁴ simulates imperforate hymen, likewise the presence of a retrohymeneal membrane above the hymen, as noted by Allen⁵ and Gillespie.⁶ Another congenital abnormality, the double vagina, may have an imperforate hymen on both sides. This has been reported by Mueller,⁷ Calverley,⁸ Carrington,⁹ Klaften,¹⁰ Martindale,¹¹ Hirst¹² and others.

PATHOLOGIC PROCESS

The presence of an imperforate hymen before the onset of menstruation may cause the accumulation of sufficient cellular debris and fluid to re-

quire surgical intervention, as in the author's Case 1. Wiener¹³ refers to a girl of twelve, in whom was found thirty ounces of white, turbid fluid. He also cites Bunzel,¹⁴ who discovered a swelling the size of a cherry between the labia of an infant six hours after birth, which, upon incision, drained mucoid material for five days. In an infant one month old, Kelly¹⁵ observed a tumorous mass filling the pelvis and abdomen to the umbilicus, when hymeneal incision produced a small amount of pus, followed by four hundred cubic centimeters of lemon-colored fluid. Hirschsprung¹³ noted a swelling between the labia of a sixteen-months-old infant, from which five to six cubic centimeters of mucinous fluid were evacuated. Henrich¹⁶ incised a bulging hymen in an infant fourteen days old, releasing one hundred fifty to two hundred cubic centimeters of clear, yellowish fluid.

A more complete analysis of the retained material was made in the author's Case 1. Here the collection was a whitish-gray, thick, mucoid material containing pus and epithelial cells, a few diplococci, and Gram neg. bacilli, but no Gram negative diplococci. However, there was a pinpoint opening below the urethra, undoubtedly accounting for the bacterial invasion.

With the advent of menstruation the whole picture changes, becoming more alarming. In the order of development there is vaginal distention (hematocolpos) and then cervical dilatation, often progressing to complete obliteration. Coincidentally the uterus softens and incrustates with the accumulating blood (hematometra). Eventually one or both tubes may become enlarged (hematosalpinx), and blood may be found in the peritoneal cavity (hematoperitoneum). It is true that in most cases explored, the oviducts were closed at the fimbriated extremities, due in all likelihood, to a "sterile salpingitis." Only one patient in this series had had an abdominal operation, therefore the extent of such pathology is doubtful. However, Nelson,¹⁷ Hellendall,¹⁸ Wilcox,¹⁹ Markus²⁰ and Kieler²¹ have mentioned seeing hematosalpinx, and Gillespie⁶ noted bilateral ovarian hemorrhagic cysts with bilateral hematosalpinx. Hellendall,¹⁸ Wilcox¹⁹ and Nelson¹⁷ refer to hematoperitoneum and hematosalpinx occurring together, while Calverley⁸ and Jones²¹ have called attention to hematoperitoneum without tubal pathology.

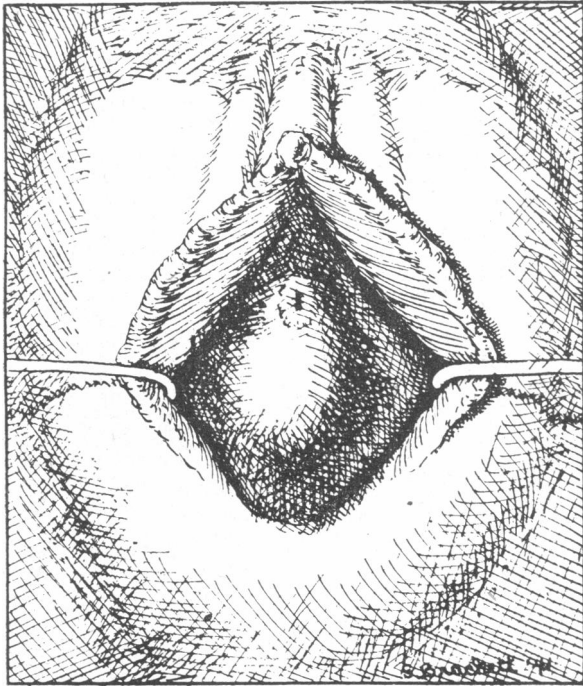
It might be assumed that sterility would result routinely from such distentions and tubal closures. But, in Case 7, one year following surgery, the patient aborted at three months, a year and one-half later was delivered of a premature dead foetus, and ten months later was delivered of a premature living female. In Case 18, a history was given of two living children who were born within four years—following surgery for imperforate hymen with hematocolpos, hematometra, and bilateral hematosalpinx. Others reporting pregnancies are Davison,²² Wilcox,¹⁹ Hellendall,¹⁸ Richter,²³ Rollins,³⁹ Oppenheimer³⁹ and Searle.²⁵ Regular menses are as a rule soon established and continue without disorder.

* Read before the Section on Obstetrics and Gynecology, at the Seventieth Annual Session of the California Medical Association, Del Monte, May 5-8, 1941.

From the Department of Gynecology, University of Southern California Medical School, and the Los Angeles County General Hospital, Los Angeles.

NATURE AND QUANTITY OF RETAINED MATERIAL

I have described in detail the material found premenstrually in Case 1. In the instance of hematocolpos, the retained blood is thick, often viscid, and chocolate brown, or, as frequently noted, "tarry." Mitchell²⁶ seems to be the only one reporting on the chemistry of the hematocolpos fluid. He recorded an increase in the calcium of 9.7 milligrams over the normal of 5.6 to 6.3 milligrams per hundred cubic centimeters of whole blood. One other variation was in the iodine content, from the normal limit of 5-20, to 90 gammas per one hundred cubic centimeters of retained fluid.

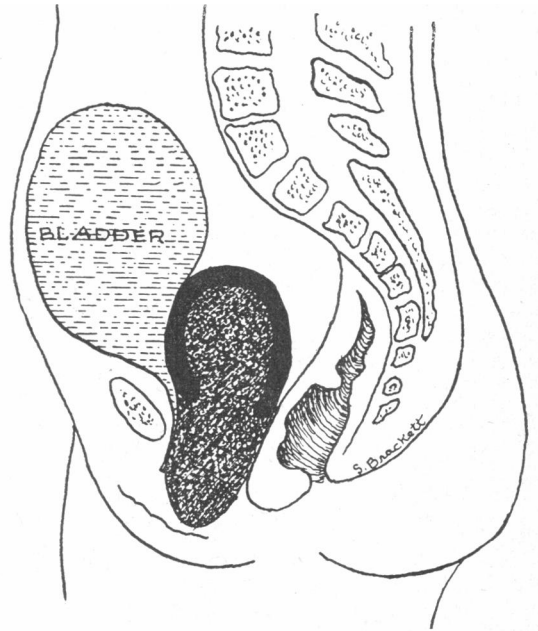


IMPERFORATE HYMEN -
BULGING - HEMATOCOLPOS.

Fig. 1.

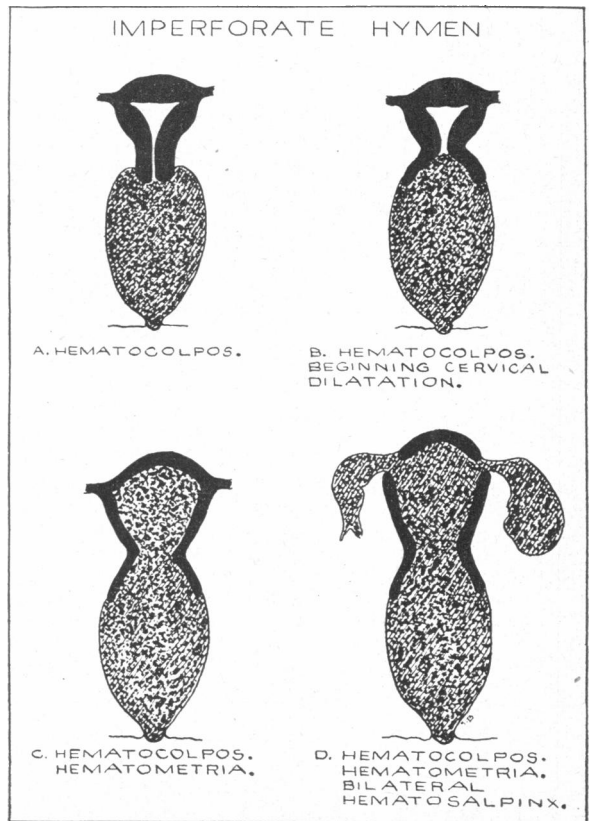
The high iodine content is of special interest in view of the work of Carter²⁷ who showed the effect of thyroxin (but not desiodothyroxin) in prolonging the active life of the spermatozoa. It has been observed that the longer the condition has existed, the more viscid will be the fluid. It is sterile in the presence of an imperforate hymen; but with even a pin-point opening culture will reveal bacterial growth, as in Cases 1 and 2 of this series.

The quantity of retained fluid differs in each case and depends upon the number of periods the patient has had, as well as the amount and duration of flow. In one case in this series, the quantity was three thousand cubic centimeters, which equals the largest amount reported in the literature. The average quantity was about one thousand cubic centimeters.



SAGGITAL SECTION...
IMPERFORATE HYMEN,
HEMATOCOLPOS,
HEMATOMETRIA, CAUSING
ACUTE URINARY RETENTION.

Fig. 2.



IMPERFORATE HYMEN

A. HEMATOCOLPOS.

B. HEMATOCOLPOS. BEGINNING CERVICAL DILATATION.

C. HEMATOCOLPOS. HEMATOMETRIA.

D. HEMATOCOLPOS. HEMATOMETRIA. BILATERAL HEMATOSALPINX.

Fig. 3.

FREQUENCY

Since imperforate hymen has been recorded in the literature less than two hundred times, it may be regarded as an infrequent anomaly. The most comprehensive analysis to date is that of Tompkins,²⁴ who compiled one hundred thirteen cases from the literature, and added five. Eleven of the present series are from the gynecological service of the University of Southern California and the Los Angeles County General Hospital, from July, 1928, to July, 1940, during which time 78,958 patients were seen. The remaining nine were generously contributed by others. The gynecological service of the University of Pennsylvania reported only five cases in the twelve years from 1926 to 1938. Gordon²⁹ reported eleven cases seen in twenty years at Bellevue Hospital. An extensive survey of the literature reveals one hundred fifty-six cases of imperforate hymen with and without hematocolpos. This includes five cases in which a sero- or hydrocolpos was associated, requiring surgical intervention. My survey of twenty cases thus brings the total, at this writing, to one hundred seventy-six.

Most of the cases are from foreign literature. The syndrome of imperforate hymen with hematocolpos was known and described as far back as three hundred years by Pare'²⁸ who diagnosed his case as pregnancy because of abdominal swelling, pain and amenorrhea.

SYMPTOMS

Usually symptoms are not encountered until the advent of menstruation. The exception appears in the few cases of sero- or hydrocolpos, where the collected cellular debris and/or serum caused comparable complaints.

Naturally symptoms will differ, depending upon how soon the patient is examined following the onset of menstruation. In the twenty cases, abdominal pain was noted in ten; abdominal mass in six; backache in five; urinary disturbances in six, of which dysuria was present in five, complete urinary retention in one, frequency in two, hematuria in two, oliguria in one and incontinence in one. Hematuria was due in one case to a urethrovaginal fistula with imperforate hymen, the patient menstruating through the fistulous tract. Constipation was noted in two cases; nausea and vomiting were present in three; a feeling of fullness and pressure was noted in one; listlessness, headache, fever, pain in the legs, vulvar irritation, and gain in weight were single complaints. In one case, epileptic-like attacks were present for two months, occurring synchronously with what probably was a period. There was no recurrence after drainage. Amenorrhea, although a constant finding, was not a complaint, which in itself is rather remarkable, in view of the ages of the patients, (the majority ranging between twelve and seventeen).

There has been considerable variance of opinion regarding the frequency of acute retention of urine. Snodgrass,³⁰ Hammond,³¹ Lazarus,³² and

Mouradian³³ have all felt it to be an unusually rare finding. I was able to find only twenty-five cases in the literature. On the other hand, Tompkins²⁴ reported it in three of his five cases. Calvin and Nichamin³⁴ cited acute urinary retention in fifteen of forty cases, with dysuria, frequency and nocturia in eight of forty cases. Acute urinary retention occurred only once in twenty cases in my survey, and only six patients complained of urinary difficulty.

The mechanism of the production of urinary retention is likewise disputed. Snodgrass³⁰ feels that it is due to direct pressure upon the urethra, while Belt³⁵ states: "It is my belief that the fixed position of the urethra allows a pressure forward of the bladder while the urethra is held fixed, thus bringing about an angulation of the urethra at the bladder neck, and, therefore, an accumulation of urine within the bladder." He feels that an overdistended bladder is responsible for considerable pain, and that it is neurogenic in origin. Further he disproves that interference with the sympathetic or autonomic nervous system is responsible for the inability of these children to empty their bladders.

DIAGNOSIS

The diagnosis of imperforate hymen is not difficult. Inspection reveals the presence of a completely-closed vaginal orifice. If hematocolpos is present, the hymen bulges, and if the membrane is thin, there is a bluish discoloration. Rectal examination discloses a distended and fluctuant vagina. The uterus may be palpated either rectally or abdominally. A mass is usually palpable in the lower abdomen. Pain may be the only complaint, and its recurrence, at monthly intervals, is very suggestive. On the other hand, the chief or only complaint may be urological. This has at times resulted in unnecessary catheterizations, and even cystoscopic studies, without relief. Not infrequently, too, laparotomies for pelvic mass or tuberculous peritonitis have been performed, without the external genitalia having first been inspected. A possible explanation for the unnecessary laparotomies is the usually elevated white cell count, in some instances as high as twenty thousand per cubic millimeter. In this series the counts ranged from 7,350 in Case 1 to 16,500 in Case 14, both in patients with serocolpos. The temperature recordings were of little help, as in 14 of 16 cases the temperatures were below 99.6 F.

Although an imperforate hymen may be present at any age, it is discovered generally between eleven and twenty. With the exception of one case at two years, those in my report ranged between ten and seventeen years.

Thus an inspection of the external genitalia should certainly be made in a patient who has not menstruated, who complains of lower abdominal pain or cramps and urinary difficulties, and who may have an abdominal mass. If examination reveals a bulging hymen under tension, the diagnosis is substantiated. If rectal palpation dis-

TABLE 1.—Case Histories

Case No.	Age	Symptoms	'W.C.C.'	Examination	Treatment	Post Operative
1.	10	Dysuria—7 mo. Vaginal fullness	7,350 60%	Hymen intact and bulging	Hymenectomy, edges sutured. Considerable thick, white material filling vagina	1 mo.—Post operative condition satisfactory
2.	16	No menses		Hymen imperforate	Excised	Menses normal
3.	14	6 mo. previously hymen opened No menses	6,500 65%	Hymen imperforate	Aspirated in doctor's office—3000cc. Incision and suturing later in hospital	4 yrs. later—Menses normal
4.	15	Lower abdominal cramps 6 mo. Backache q 2 wk. Constipated Hot flushes		R. L. Q. tenderness Hymen bulging with bluish discoloration	Hymenectomy—500cc.	Not seen again
5.	12	Abdominal pain Legs drawn up No menses	14,500 80%	McBurney tenderness and rigidity	McBurney incision Appendix appeared normal. Path: mucuc membrane ulcerated Uterus and tubes pushed to right by large mid-line swelling (hematocolpos)	1 wk.—Backache. Vaginal bulge. Hymen excised, 600-1000cc. Age 14—Abdominal pain First period in 21 mo. Hymen does not admit 1 finger. Menstrual upset Conservative treatment Age 15—Incomplete abortion
6.	12	Pain in abdomen, back and legs—2 mo. duration Constipated 1 wk. Dysuria, oliguria 3 days duration		Abdominal tenderness Hymen bulging Abdominal mass half way to umbilicus	Incised—1000cc. Dilated Lab: Epithelial cells Saprophytic bacteria	Not seen again
7.	17	Lower abdominal pain q month	10,000 65%	Mass and tenderness to umbilicus Bulging hymen	Hymenectomy—1000cc.	Menses regular 1 yr.—Pregnant with specific infection 18 mo.—Premature dead fetus 10 mo.—premature female—7 mo.
8.	15	Abdominal and back pain Abdominal mass Dysuria 3 weeks Backache Frontal headaches Hot and cold flushes	10,400 62%	Imperforate hymen Abdominal mass to umbilicus	Crucial incision 800cc. Then excised	2 yr.—Menses twice a month Constant hot flushes, headache and backache Surg: Appendectomy 1 yr. later—No menses
9.	17	Painful abdominal swelling 2 weeks Has had periodic attacks of pain previously		Hymen bulging Abdominal mass	Incised—750cc. Followed by excision	6 mo.—Menses normal, 5d. duration 3 yr.—Specific vaginitis Age 25—Menses regular. Developed some cicatricial stenosis in upper vagina
10.	14	Lower abdominal cramps 5 days Weight in pelvis Weight gain 10 lb. in 4 months	7,000 72%	Hymen bulging Abdominal mass	Incised—700cc.	Periods normal 3 mo. later opening present in hymen, but will not admit finger
11.	13	Abdominal pain and swelling 6 weeks Backache	10,320 79%	Abdominal mass to umbilicus Imperforate hymen	Excised—800cc.	5 yrs. later—Orifice admits forceps point. Menses normal
12.	13	Suprapubic pain Frequency, dysuria Nocturia 1-2 times	13,600 80%	Abdominal mass to umbilicus Acute pain in lower abdomen	Trochar puncture Suction	Not seen again
13.	17	Incontinence of urine Menses regular from urethra		Imperforate hymen Urethro-vaginal fistula	Excised hymen and repaired urethro-vaginal fistula	Menses normal No urinary symptoms
14.	2	Vaginal irritation and tenderness Hymen incised 2 times previously	16,500 33%	Labial irritation Imperforate hymen	Excised hymen and congenital membrane about urethra	Cured
15.	12	Abdominal mass 6 weeks Urinary retention Bedwetter until 8		Imperforate hymen Mass to umbilicus	Incised—500cc. Lab: No bacteria	Cured Menses normal
16.	17	Pelvic pressure Amenorrhoea		Abdominal mass Imperforate hymen	Excised	Not seen again
17.	15	Pain in R. L. Q. Nausea, headache Backache, listless		Uterus size of 4½ mo. pregnancy	Aspirated 2 qts. Then incised and dilated	Dilated hymen 1 mo. later Menses normal
18.	16	Friends talking		Uterus size of 5 mo. pregnancy	Incised 2 qts. Then excised	Married at 18 years 2 children in 4 years
19.	14	Epileptic attacks 2 months		Imperforate hymen	Incised and dilated	No more epileptic attacks Menses normal
20.	15	Crampy pain 18 mo. Swelling at introitus Backache		Mass 2½ mo. pregnancy	Incised	Menses normal

Case 13—Contributed by H. N. Shaw, M. D.
 Case 14—Contributed by E. L. Turner, M. D.
 Case 15—Contributed by A. E. Belt, M. D. and N. H. Williams, M. D.
 Case 16—Contributed by L. R. Gorman, M. D.
 Case 17—Contributed by R. B. Mervine, M. D.
 Case 18—Contributed by D. L. Wilkinson, M. D.
 Case 19—Contributed by D. L. Wilkinson, M. D.
 Case 20—Contributed by H. K. Marshall, M. D.

closes a fluctuant, "under-tension-like" mass in the vagina, hemato- or serocolpos is not likely to be questioned.

TREATMENT

The treatment of imperforate hymen has been considered a simple, minor procedure. In fact, some have been incised and drained in the doctor's office. The danger lies not so much in the surgery as in complications arising therefrom.

I cannot stress enough that scrupulous pre-operative preparation is imperative, and is best accomplished by hospitalization. Twenty-four to forty-eight hours before surgery, I should like to recommend the injection of a solution of sulfathiazole through the hymen. The dosage will depend upon the age and weight of the patient. She should then be prepared as for any major operation—the pubes and perineum shaved if necessary, and the colon emptied by a soapsuds enema.

In the lithotomy position the perineum and surrounding area is meticulously prepared with any recognized preparation. After catheterization, the first step is the gradual decompression of the retained blood by the insertion of a trochar into the vagina. Then the hymen should be excised completely and, as hemostasis is important, it should receive more than casual consideration. A continuous suture, completely encircling the cut edge, will generally satisfy this need. Some have recommended a sterile douche to further evacuate the vaginal and uterine contents, but I hesitate to favor its use. However, a procedure which should receive consideration is that recommended by Falls³⁶ of aspirating fifteen cubic centimeters of ten per cent solution of formalin, then reinjecting the whole, preceding drainage and excision.

Vaginal examination should not be made until after the next regular period. But the question of tubal involvement ought to be ascertained rectally. If palpation reveals one or both tubes distended, the question arises: Shall the patient be treated conservatively in the expectation that the retained fluid will be evacuated, or shall she be immediately laparotomized and the distended tubes incised and drained, or removed?

Decherf,³⁷ Hellendall¹⁸ and Kieler²¹ have removed one or both tubes because of incomplete tubal drainage or infection. Tompkins²⁴ reported a fatality resulting from generalized peritonitis, presumably due to rupture of an undrained right hematosalpinx. But, on the other hand, many tubes must have emptied spontaneously, and I feel that laparotomy should be performed only if symptoms persist because of incomplete drainage or infection.

Special care should be exercised during convalescence, including the following procedures: antiseptic perineal care; high Fowler position; stay in the hospital for a week with normal temperature; absolutely no douches, tub baths or swimming, until two menstrual periods have occurred.

COMPLICATIONS

The most common complications are: (1) post-

operative cicatricial stenosis following simple or crucial incision; (2) hemorrhage from the cut edge of the hymen; (3) ascending infection, leading to salpingitis, peritonitis and, possibly, death. An unusual complication is urethro-vaginal fistula. The patient reported in Case 13 of Shaw, menstruated through a urethro-vaginal fistula, while Brown³⁸ reported two, and Hirst¹² one case of urethral menses with severe urinary complaints.

SUMMARY

Imperforate hymen, with and without hemato-colpos, appears in the literature one hundred fifty-six times. Twenty cases are added, bringing the total to one hundred seventy-six.

Briefly, the most common symptoms in a patient who has not menstruated are lower abdominal pain and mass, some form of urinary discomfort, and low backache. The diagnosis is not difficult and is readily made by inspection. The treatment is most important and demands hospitalization. A solution of sulfathiazole should be injected into the vagina 24 to 48 hours before surgery, and meticulous pre- and postoperative care are demanded to prevent infection. Surgery should include complete excision of the hymen with special regard for hemostasis.

415 Camden Drive.

REFERENCES

1. Williams, J. Whitridge: *Obstetrics*, Ed. 5, New York, D. Appleton-Century Co., 1924; p. 31.
2. Davis, C. H.: *Gynecology and Obstetrics*, Hagerstown, Md., W. F. Prior Co., 1934; vol. 2, chap. 8, p. 2.
3. Hiraga, Y.: *Jap. J. Dermat. and Urol.*; 37:3 (January), 1935.
4. Jurgens, O., and Damianovich, J.: *Semana Med.*; 2:347-349 (August 5), 1937.
5. Allen, F. R. W. K.: *Brit. M. J.*; 1:826 (April 20), 1935.
6. Gillespie, James B.: *Illinois Med. Jour.*; 73:491-494 (June), 1938.
7. Mueller, S. C.: *Proc. Staff Meet., Mayo Clinic*; 7:477-479 (August 17), 1932.
8. Calverley, J. E. G. and Buttery, J. W. D.: *Brit. M. J.*; 1:590 (March 29), 1930.
9. Carrington, G. L.: *Am. J. Obst. and Gyn.*; 25:924-925 (June), 1933.
10. Klaften, E.: *Zentralbl. f. Gynak.*; 55:1584-1593 (May 9), 1931.
11. Martindale, L.: *Lancet*; 1:1389-1390 (June 15), 1935.
12. Hirst, B. C.: *Am. J. Obst. and Gyn.*; 24:843-848 (December), 1932.
13. Wiener, S.: *Am. J. Obst., N. Y.*; 75:398-400, 1914.
14. Bunzel: *Prager medizinische Wochenschrift*; 30:349, 1900.
15. Kelly: *Rev. de Gyn.*; 9:635, 1905.
16. Henrich, O.: *Zbl. f. Gynak., Leipz.*; 44:1283-1285, 1920.
17. Nelson, M. S.: *Ill. Med. J.*; 53:279-280 (April), 1928.
18. Hellendall, H.: *Zentralbl. f. Gynak.*; 57:261-265 (February 4), 1933.
19. Wilcox, DeW. G.: *J. Am. Inst. Homeop.*; 25:1100 (September), 1932.
20. Markus, E.: *Zentralbl. f. Gynak.*; 55:1031-1035 (March 14), 1931 (no. 11a).

21. Kieler, J. E.: Ugeskr. f. Laeger, Kbenh.; 79:1538-1540, 1917.
22. Davison, H. A.: Kentucky, M. J.; 19:272 (May), 1921.
23. Richter: Ztschr. f. Med.-Beamte, Berl.; 17:353-354, 1904.
24. Tompkins, Pendleton: J. A. M. A.; 113:913-916 (September 2), 1939.
25. Searle, W. N.: J. Obst. and Gynaec. Brit. Emp.; 44:729-730 (August), 1937.
26. Mitchell, J. S.: J. Obst. and Gynaec. Brit. Emp.; 41:390-395 (June), 1934.
27. Carter, G. S.: J. Exper. Biol.; 9:378, 1932.
28. Pare, Ambroise: Les Oeuvres, Ed. 9, Lyons; vol. 24, chap. 50, p. 730.
29. Gordon, O. A., quoted by Curtis, A. H.: Obstetrics and Gynecology, Philadelphia, W. B. Saunders Co., 1933; vol. 3, p. 635.
30. Snodergrass, M. R.: J. A. M. A.; 97:777 (September 12), 1931.
31. Hammond, F. C.: Atl. M. J.; 29:690 (July), 1926.
32. Lazarus, J. A.: New York State J. Med.; 32:339-340 (March 15), 1932.
33. Mouradian, A. H.: M. J. and Rec.; 135:369-370 (April 20), 1932.
34. Calvin, J. K., and Nichamin, S. J.: Am. J. Dis. Child.; 51:832-846 (April), 1936.
35. Belt, A. Elmer: Personal Correspondence, 1941.
36. Falls, Frederick H.: Personal Correspondence, 1941.
37. Decherf: Bull. Soc. d'obst. et de gynec.; 21:198-199 (March), 1932.
38. Brown, Isaac Baker: On Some Diseases of Women, Philadelphia, Blanchard and Lea, 1856; chap. 10, pp. 137-141.
39. Discussions following presentation by Palmer, H. E., J. Florida M. A. 12:99-101 (Oct.), 1925.

RADIATION THERAPY IN EXTENSIVE BLADDER CARCINOMA*

WILLIAM E. COSTLOW, M. D.
Los Angeles

IT IS generally accepted that the majority of bladder carcinomas, when first seen, are too extensive to be amenable to surgical removal. Probably seventy-five per cent are inoperable. Furthermore, the common site of the bladder tumor is in the vicinity of the trigone and urethral orifices, making local excision difficult or impossible.

In the past the smaller growths (3 centimeters in diameter or less) have been dealt with by means of excision, cauterization, electrocoagulation by transurethral or suprapubic routes, and by radon seed or radium needle implantation. However, one is reminded of the statement by H. C. Bumpus, Jr.¹ that "to find one out of four patients with tumor of the bladder alive after five years, no matter what the method of treatment used, is unusual." Bumpus reported twenty-five per cent five-year cures in inoperable cases by transvesical destruction with diathermy.

VARIOUS METHODS

The best results secured in a large series of bladder carcinomas are those recently reported by Benjamin S. Barringer,² of the Memorial Hospital in New York. Of 228 cases, 90 had papillary carcinoma and 138 were of the infiltrating type. All were treated by means of radon seed implantation; 129 through suprapubic cystostomy, 41 cystoscopically, and 44 by a combination of these methods. Seventy-one (37.8 per cent) of the patients passed the five-year period without recurrence.

The method of treating extensive bladder carcinomas by low intensity radium element needles (containing 1, 1.3 or 2 milligrams of radium element, filtered by 0.5 millimeters of platinum) has been described by Cade³ of London. The bladder is opened and the needles are implanted in the tumor bed and sides of the lesion, including an adequate margin of tissue around the lesion. From 10 to 30 milligrams of radium are used, the needles remaining in place from nine to ten days. Bladder drainage is secured by continuous suction throughout the entire period of irradiation. Cade believes this method superior to seed implantation, in that it results in a more accurate geometrical pattern of distribution, with adequate dosage in the tumor bed and at the periphery of the lesion. It avoids over dosage in some areas, with sublethal dosage in other areas.

Cade found that tumor dosage of from 3,000 to 5,000 r was not sufficient, except in the papillary type of growth. He now advises dosages as high as from 8,000 to 9,000 r in the tumor, with a rate of from 35 to 45 r/hr. The surrounding tissues are able to tolerate doses of this order, due to the prolongation of exposure time.

Cade reports his results of the radium element needle technique from 1927-1933 as follows:—Fifty-four cases treated, thirty-six dead, fourteen alive, and four untraced. The length of life after treatment of the fourteen successful cases was as follows:—Seven years (one), four years (two), three years (three), two years (six), and under two years (two).

Cade also refers to the work of A. J. Durden-Smith³ at the Radium Institute, London. Thirty-eight cases were treated by the radium needle technique, thirty by the cystoscopic method, and eight by the suprapubic route. Four were alive over three years, three over four years and six over five years.

Fletcher Colby⁴ has observed marked palliation by external irradiation at a million volts. The flat, ulcerating, infiltrating carcinomas responded better than the papillary. Out of 24 cases, the tumor regressed completely in 7, but recurred in all but one.

AUTHOR'S PROCEDURE

Early hopes that supervoltage (525 K.V.) x-ray therapy would better our results, compared to 200 K.V., have not been very well realized. We have 33 cases to report (excluding a number

* Read before the Section on Radiology at the Seventieth Annual Session of the California Medical Association, Del Monte, May 5-8, 1941.

From the Los Angeles Tumor Institute.