

Historical Articles

LEGACY OF EDWIN BEER: FULGURATION OF PAPILLARY BLADDER TUMORS

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ABSTRACT

Purpose: Edwin Beer introduced the first endoscopic treatment of papillary bladder tumors in 1910. This historical review describes how his landmark discovery paved the way for office cystodiathermy to treat recurrent papillary tumors.

Materials and Methods: The medical writings of Edwin Beer and all studies pertaining to the treatment of papillary bladder tumors from 1879 to the present were reviewed.

Results: Edwin Beer discovered that papillary bladder tumors could be destroyed through the ordinary cystoscope with high frequency current by electro-coagulation. This therapy revolutionized the treatment of bladder tumors.

Conclusions: The legacy of Edwin Beer is that office fulguration of recurrent papillary bladder tumors has now become a practical reality due to recent changes in the histological classification of papillary tumors, better definition of their biological behavior and improved endoscopic equipment.

KEY WORDS: bladder, cystoscopy, diathermy, papilloma, history of medicine

Endoscopic treatment of bladder tumors began with Edwin Beer (1876 to 1938). Beer made many contributions to urology¹ but none was more important or lasting than his landmark fulguration of bladder tumors. Using high frequency current he introduced for the first time a practical therapy for the most frequent type of bladder neoplasm, the papillary tumor. This therapy revolutionized the treatment of bladder tumors. His epochal discovery represented, in fact, 3 advances disguised as one. 1) Beer showed that it was possible to destroy a bladder tumor using electrocautery through the cystoscope. 2) He was able to control recurrent tumors repeatedly using the same method. 3) He made the cystoscope an instrument for diagnosis and therapy. Beer deserves to be remembered now because cystoscopic fulguration of bladder tumors using high frequency diathermy is still practiced today and it is especially relevant in view of recent changes in the histological classification of papillary bladder tumors.

BACKGROUND

Edwin Beer was born in 1876 to wealthy parents in New York City. He graduated from Columbia College in 1866 and earned a medical degree in 1899 from the College of Physicians and Surgeons of Columbia University. While his privileged upbringing probably shaped his demeanor to appear aloof and even snobbish to others, he punctuated his professional work with balance and modesty (see figure).

Beer served as an intern at Mount Sinai Hospital in New York from 1899 through 1902, a highly coveted post for those interested in surgery. He then embarked on a period of post-graduate study in Prague, Vienna and Berlin, which was expected of those of his era interested in a successful surgical

career. In Europe he was presumably exposed to developments in endoscopy pioneered by Max Nitze.

On his return from Europe Beer was appointed to the staffs of Mount Sinai, Bellevue, Lenox Hill and Flower hospitals. In 1910 he was appointed attending surgeon and chief of genitourinary surgery at Mount Sinai Hospital. Among an elite group of founding fathers of urology assembled in New York in the early 1900s Beer was highly respected in urological circles as a superb surgeon, fine diagnostician, lucid teacher and loyal friend. Others described his work as ever in the forefront of surgical progress, always practical, marked by sane thinking and imbued with the logic of the philosophical mind. After a life filled with accomplishments he resigned as chief of urology in March 1938 and died 5 months later.^{2,3}

BLADDER TUMORS IN THE PRE-CYSTOSCOPY ERA

Although bladder tumors were first described in 1551 by Lacuna, the lack of diagnostic accuracy inhibited effective therapy. Despite scattered reports of excising an occasional tumor found during lithotomy the first operation for bladder tumor was performed in the 17th century. The first operations were limited to women, in whom the urethra was dilated and a tumor presenting in the urethra or bladder neck was grasped and amputated. When endoscopy permitted enough visualization inside the urethra, Desormeaux was able to extract a urethral papilloma through the urethroscope. Grunfeld later developed an endoscopic loop threader, scissors, forceps and knives, and was the first to remove a bladder papilloma using his urethroscope in 1881. Such instrumentation did not allow routine operations inside the bladder and in 1874 Billroth introduced open suprapubic removal of bladder tumors. Thereafter tumors were excised through suprapubic or lateral perineal incisions by ligatures, écrasement (steel wire loop ligature), arrachement (tearing out) enucleation or cauterization (Paquelin cautery).⁴

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Edwin Beer (1876 to 1938)

The advent of cystoscopy by Nitze in 1877 facilitated the diagnosis and subsequently the systematic endoscopic treatment of bladder tumors. Nitze constructed an operating cystoscope between 1891 and 1894,⁵ permitting Howard Kelly of Baltimore to achieve limited success snaring polyps from the urethra and bladder neck in women. Nitze was the first to coagulate a bladder papilloma with a hot light bulb of the cystoscope and he later devised accessory cold and hot wire loops for galvanocautery, reporting remarkable results with his cauterizing operating cystoscope in a large series of cases. Although the Nitze cystoscope was difficult to manipulate and galvanic cautery using the wire loop proved to be an unreliable treatment for bladder tumors, Beer recognized the importance of these early achievements and chastised his profession for not taking advantage earlier of what Nitze and others had offered.⁶

A REVOLUTIONARY NEW METHOD

In 1908 Beer conceived the idea of using high frequency electric current through a catheterizing cystoscope to electrocoagulate bladder tumors. The American cystoscope maker Reinhold Wappler told Beer that his idea was untenable because an air gap between the tumor and electrode was essential to create a coagulating current and the current would burn out the cystoscope. Undaunted, Beer used a 2-channel Nitze cystoscope and a monopolar (Oudin) current derived from a resonator made by Wappler for bladder tumors. In 1 channel he inserted a 6Fr insulated copper electrode and in the other on he inserted a tube for irrigation. Direct current was applied at various points to papillary growths for 15 to 30 seconds at a time, while the bladder was distended with sterile water. He saw no spark when the full current was thrown on without resistance. Tumor tissue was desiccated at cautery points and patients experienced no more discomfort than during ordinary cystoscopy. Beer reported his first 2 successful cases in a landmark article on

May 28, 1910, claiming fulguration to be "proven effective in the cure of bladder papillomas."⁷

For the next 18 years Beer devoted much of his time to the study of bladder neoplasms as he continued to develop and improve his new method of treatment, reporting his aggregated experience of cases in 1935.⁸ Urologists, especially in Europe, were skeptical at first but they soon joined their American counterparts and endorsed the method. In 1918 Hugh H. Young proposed that "benign papillomas should be treated by endoscopic fulguration."⁹ In studying the treated natural history of bladder tumors Beer advocated painstaking segregation of cases, accurate description of treatments used and careful followup for prolonged periods (sound principles of clinical investigation that we should remember and emulate).

After Beer died in 1938 Reed Nesbit wrote, "Development of this technique by its brilliant discoverer marked one of the greatest advances in the history of urology; it led not only to radical change in the therapeutic management of bladder tumors, but also paved the way for subsequent electroresection methods by proving that high-frequency current could be employed effectively under water."¹⁰ It did all of that and more.

PAPILLARY TUMORS

An aphorism of Beer was that transurethral coagulation worked best for papillary tumors. In the early 1900s urologists recognized at least 2 types of bladder tumors, of which 1 was definitely benign and the other was malignant (or at least papillary tumors tended to behave in indolent fashion, whereas cancerous tumors were invasive and lethal). For 25 years after Beer introduced his new method in 1910 fulguration was used successfully around the world to destroy benign papillomas and occasionally small papillary carcinomas. In 1931 Stern and McCarthy in New York finally perfected the first practical cutting loop resectoscope. Thereafter, transurethral resection (TUR) dominated surgical management of papillary tumors.

A major reason that TUR became favored over fulguration alone was, of course, that not all papillary tumors were benign. Some were indeed malignant or they developed into malignant or invasive tumors. By 1935 even Beer was pessimistic about the efficacy of endoscopic diathermy because it was applicable only to small tumors and did not prevent recurrent tumors.⁶ Another point of continuing controversy was that pathologists could not always distinguish between benign papillomas and papillary carcinomas, and a number of studies in the 1950s and 1960s showed that between 10% and 20% of patients treated for benign papillomas eventually had malignant tumors. As a result, pathologists and urologists tended to use the terms interchangeably, labeling all papillary tumors as cancers. Some classification schemes in the mid 1900s did not even include benign papilloma in their lexicon, leading to considerable confusion in the end results of treatment. In 1965 the famous Memorial Hospital pathologist Fred W. Stewart wrote, "Individuals interested in bladder tumors cannot help being confused by widely-divergent end-result data from different sources. This is very largely the fault of the pathologist who, in confusing himself, confuses the clinician still more. Many pathologists call bladder papilloma cancer, leading to a false picture and rosier tint to bladder cancer results than is real. True bladder cancer is a highly lethal process."¹¹

Although pathologists recognized that the biological behavior of papillary tumors correlated with morphology, they disagreed over the frequency of benign papillomas. Most regarded papillomas as exceedingly rare, representing only 1% to 2% of bladder tumors, whereas others believed that 20% or more of bladder tumors should be classified as papillomas.¹² Amid an era of confused definition and uncertain

biological potential of papillary tumors urologists continued to fulgurate papillary bladder tumors in much the same manner described by Beer, although often during TUR and using better equipment. Successful fulguration of papillary tumors was reported by Reynolds (1949), Hollands (1950), Warren (1951), Masina (1952), Milner (1953), Coppridge (1954), Lund and Lundwall (1955), Irvine (1955), Nichols and Marshall (1956), Berry and White (1957), Thompson (1960), Jones and Swinney (1962), Couvelaire (1964), Mills (1964), Pyrah (1964), Barnes (1967) and Whitmore (1970). Treated individuals also appeared to live normal life spans.

In 1997 members of the World Health Organization (WHO) and International Society of Urologic Pathologists (ISUP) attempted to resolve the controversy and confusion surrounding papillary tumors by devising a classification system that would accurately reflect their diverse biological potential, help guide local treatment and gain widespread acceptance. Papillary lesions had long been a source of controversy because grading systems were vague and subjective. Some pathologists required restrictive criteria for the diagnosis of papilloma and would label such lesions as malignant. Others, not wanting to label a patient with low grade lesions as having carcinoma, would diagnose them as papilloma. An intermediate category, papillary urothelial neoplasm of low malignant potential (PUNLMP), was introduced to diagnose a papillary lesion as not fully malignant but it could become malignant. The WHO/ISUP consensus system classifies non-invasive papillary tumors according to their morphological features as papilloma, PUNLMP, low grade and high grade papillary carcinoma.¹³ Using the WHO/ISUP system the risk of a high grade or invasive tumor is 0% for papilloma, 0% to 8% for PUNLMP and 5% to 13% for low grade (TaG1) papillary carcinoma.^{14, 15}

THE LEGACY

Although for years urologists have undoubtedly fulgurated small recurrent papillary tumors, combining the categories of papilloma, PUNLMP and TaG1 into a single group of low risk tumors now makes this practice appealing and more plausible. Furthermore, as Beer and his colleagues did in their time without the benefit of routine histology, urologists today should be able to identify clinically benign recurrent papillary tumors by their appearance at cystoscopy.¹⁶ Fulguration of such tumors is practical, safer and less burdensome for patients than routine transurethral resection.

As a tribute to the legacy of Edwin Beer, the author has followed 575 patients with low risk papillary tumors for more than 5 years (range 5 to 15) and used cystodiathermy to treat recurrent tumors. Transurethral resection of the first papillary tumors diagnosed papilloma in 53 cases (9%), PUNLMP in 84 (15%) and low grade papillary carcinomas (TaG1) in 438 (76%). Patients underwent office flexible cystoscopy every 3 to 6 months. Recurrent papillary tumors were fulgurated during cystoscopy.¹⁷ During a decade of followup all patients had multiple recurrent tumors. The average number of tumors treated with fulguration was 4.29 per patient year (1 to a maximum of 16 tumors treated at 1 cystoscopy). The average number of tumors yearly was 3.86 in patients presenting with papillomas, 3.25 in those with PUNLMP and 4.54 in those with TaG1 tumors. In 23 patients (4%) high grade noninvasive papillary tumors (TaG3) developed and 12 (2%) progressed to invasion. None of the papillomas or PUNLMPs progressed. TUR was triggered by too many or large recurrent tumors to handle by fulguration, conversion of negative to positive urine cytology or cystoscopic appearance suggesting a high grade papillary tumor or carcinoma in

situ. In contrast to frequent fulguration of recurrent tumors, patients averaged only 0.47 TURs yearly or about 1 TUR every 2 years during a 10-year followup. Although all patients had multiple tumor recurrences, none died of disease. The later skepticism of Beer was premature and it seems he was right to conclude that fulguration may cure existing and recurrent papillary tumors.

Toward the end of his life, Beer reflected back on his discovery as "only the first chapter in the problem and in years to come, when subsequent chapters are written, we will appear to our successors as inept as do the surgeons prior to 1874 seem to us today."⁶ A modest statement but far from the case. For almost a century the once untenable idea of Beer ingeniously transformed into reality continues to unfold and it remains a mainstay among treatments used locally to control common papillary bladder tumors. Beer would probably be delighted and justifiably proud that his innovative first endoscopic treatment of bladder tumors continues to be used to benefit many patients and it has left such an indelible mark on later generations of urologists.

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