

BJUI UNMODERATED POSTER ABSTRACTS

BJU INTERNATIONAL

U 1

Sun Shimiao: the man who invented urethral catheterization

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Introduction: Sun shimiao (AD 581–682) made many valued contributions to the Chinese traditional medicine. The work he was most noted for was his book "A Thousand Gold for Emergencies" and his invention of urethral catheterization.

Methods: A systematic search of Chinese textbooks, manuscripts and original writings were made for articles by or about Sun shimiao.

Results: Sun Shimiao was a Taoist and lived in the Tang Dynasty (AD 618–907). His book "a Thousand Gold for Emergencies" was his masterpiece and the text systematically showed the use of acupuncture in treating many conditions including headaches, back pain and ED. Before Sun's time, patients with acute urinary retention were treated by acupuncture and herbal medicine. Unfortunately many patients still could not urinate. Sun firstly used the hollow leaves of alliumfistulosum plant as a catheter and passed it down the urethra of the patient. The patient was able to pass urine through the hollow leaf. After that, Chinese physicians began to use differed kinds of reeds and straws to perform urethral catheterization.

Conclusions: Sun shimiao pioneered Chinese traditional medicine as well as being the founding father of Chinese urology. However, he will be best remembered for being the first to describe successful urethral catheterization.

U 2

The long term effects of castration: lessons from Chinese eunuchs

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Introduction: Androgen-deprivation therapy remains the standard treatment for advanced prostate cancer. We are now becoming aware

of the long term side effects. Studies on the Chinese eunuchs have shown us the long term consequences of castration in men.

Material and Methods: Internet search using terms "eunuch" "China" and review of published literature on these topics.

Results: There are two medical studies on Chinese eunuchs. In 1930, Ferdinand Wagenseil examined 31 eunuchs in Beijing. The average duration of castration was 38 years. Twenty of them had kyphosis of the spine. These observations were made before it was recognized that kyphosis is a manifestation of severe osteoporosis in women. Wagenseil also reported gynecomastia among them. In 1960, there were 26 eunuchs still living in Beijing. Jieping Wu had the opportunity of examining them and found that the prostate of these men was impalpable. This is probably the largest series of castrated men followed for a long period of time and it confirms that testicular testosterone is essential for the development and enlargement of the prostate.

Conclusions: These unique studies have identified the long term effects of castration. It is important that these complications are recognized when considering long term androgen-deprivation therapy.

U 3

Papyrus to prostheses – the evolution in managing Priapism

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Introduction: Although mention of Priapism is made in man's earliest writings, current management regimes have evolved remarkably recently.

Methods: A literature search for articles and textbooks on Priapism was performed using the Wellcome Trust's and RSM's databases, and Medline and Google scholar websites.

Results: The Ebers papyri describe drugs that the Egyptians prescribed for the condition. In the 19th century "conservative" management was adopted in preference to surgical intervention following the "successful" use of leaching. At the beginning of the 20th century, however, larger series were published and incision was popularised. The perceived

association with lasciviousness and drinking persisted, and as recently as 1964 truth serum was employed to reveal associated psychological abnormalities. In the 1970's shunting procedures were described, but it was only in 1990 that the differentiation between high and low flow causes was made. Around this time, urgent management to prevent ischaemia was established. Many contemporary authors now recommend early insertion of prostheses if more conservative measures have failed.

Conclusions: In spite of wide spread interest in the condition for three millennia the mechanism of Priapism has only recently been understood, and current diagnosis and management bears little resemblance to that seen only a few decades ago.

U 4

Masturbation and mass delusion – the story of spermatorrhoea

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Introduction: Spermatorrhoea, the involuntary loss of semen, was once considered to be "a subject of more importance, as regards human health and happiness, than perhaps any other that can be mentioned".

Materials and Methods: A literature search for articles and textbooks on spermatorrhoea was performed using the Wellcome Trust's and RSM's databases, and Medline and Google scholar websites.

Results: The French professor Claude Lallemand wrote in 1835 of "a disease that degrades man, poisons the happiness of his best days, and ravages society". Soon, throughout the Western world many a young man "terminated a short-lived, miserable existence by suicide, or dragged out his life in a state of idiotic imbecility". The cause: "long continued and frequent self-abuse", the cure: cauterization of the prostatic urethra and spiked penile rings. At the end of the century surgeons questioned the very existence of spermatorrhoea, which had become "to the public a term of terror", and it faded from prominence. Such conditions, however, are still "treated" in Eastern societies which have similar views on sexuality to our pious 19th century forefathers.

Conclusion: The mass delusion of spermatorrhoea is a cautionary example of the power of medics to both falsely judge and harm their patients.

U 5

On lust and rage – W. B. Yeats, vasectomy, virility and prostate cancer

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Introduction: Attempts to restore testosterone in the aging male have been made for 100 years, whilst testosterone deprivation has been the mainstay of treatment of metastatic prostate cancer. Concepts about the interrelation of these have altered over this time.

Materials and Methods: A review of the work of W.B Yeats was made and Medline searched for articles relating to the work of Charles Huggins, the link between vasectomy and Prostate cancer, and hypogonadism.

Results: In 1934 Yeats underwent vasectomy in the belief that this would restore virility, seemingly benefiting his late work. Around this time Charles Huggins completed work on castration on metastatic prostate cancer, leading to a belief that raised testosterone levels predisposed to the development of the disease. In the 1990's, therefore, it is understandable that an explanation of the finding of an increased risk of prostate cancer in men who had been vasectomised was, again, that the procedure raised levels of the hormone. Attention remains focused on hypogonadism, now linked with many conditions including, ironically, high risk prostate cancer.

Conclusions: Concepts about testosterone in the aging male have changed over the last century. We can presume they will continue to do so.

U 6

The management of urethral strictures in ancient India (1000–600 BC): the era of Susruta

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Introduction and Objectives: Susruta lived in India (1000–600 BC). Through his compendium of knowledge, the Susruta Samhita we re-live Susruta's contribution to urology with reference to his management of urethral strictures.

Material and Methods: Time related sources in medical and historical literature were reviewed, including the Susruta Samhita.

Results: Susruta provided great insight into the pathogenesis of urethral strictures. He recognised promiscuous sexual practice was associated with painful urethral discharge and difficult urination. The intra-urethral instillation of herbal medication was advocated and went onto describe sexual hygiene in disease prevention. Susruta described the passage of a hollow tube open at either ends. This was lubricated in butter and passed through the urethra until the flow of urine commenced. Upon removal, the marrow of a boar should be spread over the affected part. Every third day, a tube of thicker diameter was introduced until the flow of urine improved. An alternative surgical approach described was to place an incision at the lower part of the penis avoiding the midline raphe of the perineum.

Conclusions: The management of urethral strictures by Susruta was unique and unequivocal for its time. It continues to hold parallels to modern day management 3000 years on.

U 7

'Vasectomy'

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Introduction: Vasectomy has been used for a multitude of conditions other than birth control. We explore 'Vasectomy', a term coined to describe incentives used by governments to promote vasectomy programmes and influence global population.

Methods: Time related sources from local and international media were reviewed, including political propaganda.

Results: Vasectomy programmes have been observed throughout the world. Of note, family planning festivals in India resulted in over 32.7 million operations performed. Those who refused to attend camps were subject to government sanctions. In Bangladesh, religious leaders were pressured to advocate the operation as the ideal method of birth control and 'agents' mediated vasectomy programmes. These men coerced and delivered patients to clinics. In return, they were paid a small fee. Hong Kong in the 1970's, launched a strong media campaign advocating vasectomy using television, radio and rail service advertisements featuring characters, 'Mr.

Vasectomy' and 'Mr. Birth Control.' Wolfers in 1973 recognised these global vasectomy programmes were purely political. He stated vasectomy "will (never) contribute to the solution of the world's problems."

Conclusions: The history of vasectomy is diverse and although an effective procedure, its introduction as a political 'operation' has not influenced global population control.

U 8

Minimally invasive surgery: an ancient art

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Minimally invasive surgery has a long history stretching back to the ancients. Certain Old Testament passages seem to predict the use of laparoscopy, including Ezekiel 21:21:- 'For the king of Babylon stood at the parting of the way.., to use divination: he made his arrows bright, he consulted with images, he looked in the liver'. Hippocrates (460–375 BC), the father of medicine, whose principles were adhered to for over a millennium, was the first endoscopist, using a speculum and cautery to treat haemorrhoids. He describes it thus in his treatise 'On haemorrhoids';- 'But if the condyloma be higher up, you must examine it with the speculum.' Later, Galen, practising in Rome, described the extensive use of surgical instruments in Roman times and many of these artefacts look remarkably similar to their modern counterparts. These include male catheters, vaginal and rectal specula. The medieval Arab, Abu al-Qasim wrote his treatise *Al-Tasrif* in AD 1000 which contains many descriptions of urological instruments, including those to examine the urethra, the throat and the ear and he used natural reflected light to examine the cervix. We aim to outline the development of ancient surgical practice, particularly as a precursor to modern minimally invasive urology.

U 9

The story of the Boari Flap

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Introduction: In 1894 Achille Boari (Ferrara, Italy) invented the bladder flap to replace the lower ureter.

Materials and Methods: A Medline search of the Italian and English literature was made and his original publication of "Chirurgia

dell'uretere" (1900) was accessed at The Royal Society of Medicine Library, London, UK.

Results: Historically an injury or a lesion of the ureter leads to nephrectomy. Achille Boari conducted numerous experiments on dogs including uretero-ureterostomy (end to end, end to side), uretero-pyelostomy and ureterocystostomy. He also unsuccessfully attempted to substitute the ureter with the carotid artery, trachea and a glass tube. His early experiments failed because of leakage and peritonitis. Finally, in 1894 Boari realized a bladder flap could be used to substitute lower third of ureter in a dog and it was still alive 4 years later. In 1936 Ockerblad was the first surgeon to use the Boari flap. The patient had sustained a ureteric injury following a hysterectomy and her pyelogram 10 years later remained normal.

Conclusion: The Boari Flap saved many patients from a nephrectomy and it's still accepted as an important and effective procedure in replacing the lower ureter.

U 10

Evolution of the surgical technique of partial nephrectomy: historical perspective
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Introduction: We chronicle improvements in Partial Nephrectomy (PN) surgical technique since its inception to provide perspective as regards its place in treatment of renal tumor.

Methods: A comprehensive review of original literature of partial nephrectomy was performed including MEDLINE and PUBMED.

Results: The first PN for renal tumor was described by Czerny (1890). By removing a small renal tumor in the presence of normal contra-lateral kidney, Vermooten (1950) laid the foundation of nephron sparing surgery. Kerr (1959) and Klotz (1960) introduced renal hypothermia. Poutassse (1962) improved the surgical technique of PN on basis of segmental blood supply of kidney. As a result of these advances, open PN was practiced frequently by urologists from USA and rest of the world. Gill (2002) popularized the laparoscopic PN by duplicating established open techniques and principles. Gettman (2004), Phillip (2005), Kaul (2007), and Aron (2008) showed feasibility of PN with da Vinci robot assistance. The long-term outcome data from open/laparoscopic PN [Herr (1999), Fergany (2003, 2006), Gill (2003, 2007)]

showed decrease in warm ischemia time, improvement in cancer-specific survival.

Conclusion: Milestone advances in the field of renal physiology and PN surgery has expanded the indications of PN to pT1b kidney tumors.

U 11

The history of prostate cryotherapy
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Introduction: History of prostate cryotherapy is discussed.

Methods: A literature search was performed reporting prostate cryotherapy history/development.

Results: First reports on the use of cold treatment date back to 2600 BC. In 1850 British physician James Arnott reported on the therapeutic effects of ice slush in the treatment of breast and uterine tumours. The breadth of cryosurgical applications in Urology grew rapidly in the 1960's. An early liquid nitrogen cryosurgery probe used in the canine prostate was subsequently adapted to permit cryoablation for BPH. Successful open perineal placement of prostate cryoprobes was performed in 1972 and later transperineal ablation was achieved. However technological support for prostatic cryosurgery was inadequate at the time, with unacceptably high complications. It thus fell into disuse until a re-birth in 1993 with the use of TRUS, multiple, small diameter, liquid nitrogen powered cryoprobes capable of independent temperature control, probe insertion guides and urethral warming catheters to produce a minimally invasive procedure.

Conclusions: Technologic advancement in the number and type of cryoprobes has significantly refined cryoablative surgical procedures. These advancements have now reached a level of sophistication whereby 17-gauge cryoneedles can be inserted through a "brachytherapy-like" template under TRUS with precise control of the freezing process.

U 12

Leonardo da Vinci, urology and the da Vinci robot
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Introduction: The name "da Vinci" has been ingrained in Urology with popularization of

robotic prostatectomy. We present a historical review of Leonardo da Vinci's contribution towards urology and the development of the da Vinci Robot.

Methods: Royal Collections at Windsor were personally researched and Intuitive Surgical was corresponded regarding the development of the current da Vinci robot.

Results: Leonardo the artist was also an engineer, inventor, anatomist, architect, and a musician. Leonardo underwent training in anatomy and drew muscles, skeleton, vascular system, and sex organs. The painting "The copulation" is drawn so intricately depicting some of the fallacies of that time. He depicts the urethra to carry two tubes, one for semen, originating from the spinal cord and the other to carry urine. Leonardo is credited to have designed the first robot around 1495. The designs in the sketchbook were rediscovered in the 1950s! The initial prototypes of the present da Vinci robot were named "mona" and "lisa".

Conclusion: Urological contributions of Leonardo are noteworthy. Leonardo's visualization of a mechanical robot as early as in the 15th Century truly shows that he was far ahead of his time and rightly deserves to have the robot named in his honour.

U 13

Laparoscopic urology: a drive towards excellence
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Introduction: Laparoscopy has revolutionized the practice of urology. Even though the concept of minimal invasive surgery dates back to AD 900, it has evolved tremendously over last decade.

Method: A web-based search was performed for the history of laparoscopy in urology.

Results: Initial report to visualise the abdominal/pelvic cavity were made by Arabian physician Abukasim (AD 936-1013). But Kelling (1901) is generally credited with first attempt to inspect the peritoneal cavity with insufflations {Koeliskopie}. In 1910, Hans Jacobaeus coined 'laparoscopy' and performed the first laparoscopic procedure. Use of carbon dioxide instead of air (pneumoperitoneum) was suggested Korbsch (1927). The Veress needle was introduced in 1938. First laparoscopic nephrectomy and pelvic lymphadenectomy performed by

Clayman and Schuessler respectively (1991). In 1992, first laparoscopic radical prostatectomy (Schuessler et al) and laparoscopic nephrectomy (Ganger et al) were performed. Gaur used balloon for retroperitoneal dissection in 1992 and performed first retroperitoneal laparoscopic nephrectomy. Schuessler et al (1993) are credited with laparoscopic pyeloplasty. McDougall et al did first laparoscopic nephroureterectomy (1995) and Gill et al (2000) described first radical cystoprostatectomy with ileal conduit.

Conclusion: Major developments in laparoscopic urology were seen in 20th century and further evolution is still to come.

U 14

Guevedoche, Guevedoces, Machihembras, Kwolu-aatmwol and history of 5- α reductase enzyme

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Introduction: 5-Alpha Reductase (5ARase) inhibitors have a well established role in the management of BPH. Congenital deficiency of 5ARase deficiency can lead to male pseudohermaphroditism. Our research focused on the history associated with the discovery of this congenital disorder.

Methods: Extensive research on the historical aspects surrounding this fascinating condition.

Results: The term Guevedoche or Guevedoces is Spanish slang that literally means "Penis at the age of 12". Dr Julianne Imperato first published his research in 1977 about a cluster of cases of pseudohermaphrodites in a remote village of Dominican Republic. The subjects were being raised as a female and at puberty, they developed enlargement of the penis and other secondary male sexual characters. Locally, they were called as "machihembras" (first female and then male). Research revealed them to have 5ARase type-2 deficiency. Similar cluster of cases is seen in Papua New-Guinea and the local term is "kwolu-aatmwol" (female thing transforming into male thing). Reports from Asia suggest that a similar transformation of a female-to-male is considered a divine intervention and such subjects are revered!

Conclusion: The history behind the discovery of 5ARase is interesting and its association with the congenital abnormality in these rural areas even more fascinating.

U 15

The historical depiction of Priapus in art, architecture and literature

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Introduction: Etymology of priapism is from the Greek God, Priapus. Our research was focused mainly on the representation of Priapus in Art form and its interpretation.

Materials and Methods: Literature search was focused in the world of art, architecture, museums and mythological texts. This poster will display the popular colourful depictions of Priapus in art form.

Results: Priapus, son of Aphrodite and Dionysus, was the God of fertility but also protector of horticulture and viticulture. He is depicted with a huge erect penis, hence the term priapism. Statues with the erect penis were common in gardens of ancient Greeks, warning thieves, "He who shall plunder with dishonest hand the little field committed to my charge, shall feel me to be no eunuch". Fascinating illustrations of Priapus was discovered in various art forms, especially votive offerings. The oldest surviving fresco at Pompeii, showing Priapus weighing his huge penis against a bag of money! Paintings by Deakin, Lombard and others exist. Priapus is also mentioned in Poems priapeia and in classics by Ovidi.

Conclusion: History behind Priapus, the etymological origin of Priapism, depicted with his erect penis is found in various art forms and constitutes a fascinating historical aspect of urology.

U 16

Charging through history: the role of electricity in treating voiding dysfunction

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Introduction: Urology has been at the forefront of pioneering new technologies, an example being the use of electrical stimulation to treat voiding dysfunction. Developments in this therapy have now culminated in commercial devices for both central and peripheral nerve stimulation to treat voiding dysfunction.

Methods: The history of electrical stimulation in treating urinary voiding dysfunction is reviewed.

Results: Saxtorph is credited with the first attempt at intravesical electrical stimulation

to treat urinary retention in 1878. Further modifications were reported by McGuire (1950s) and Boyce (1960s). Urinary incontinence was treated by Caldwell (1963). Since the 1970s, however, interest has focused on direct stimulation of nerves. Nashold (1971) was the first to stimulate the S1-3 nerve roots to achieve voiding, and Brindley (1970s) popularized the use of anterior root stimulation in spinal cord injury. Tanagho and Schmidt (1980s) pioneered the development of sacral neuromodulation for urinary incontinence and retention, and this led to the evolution of the Interstim[®] device, now also used for chronic pain.

Conclusion: There has been a technological evolution over a century of electrical therapies for treating voiding dysfunction, and now a greater appreciation of the role of afferent as well as efferent nerve stimulation.

U 17

'Fiat lux': let there be light! The contribution of Harold Hopkins to modern day urology

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Introduction: Harold Hopkins brilliant work on optics was instrumental in the development of modern endoscopy and is a true milestone in the development of minimally invasive surgery.

Methods: A systematic search of online and published material was conducted.

Results: Harold Horace Hopkins was born in Leicester in 1918. His first major contribution was development of a zoom lens in 1948 which was used at Lords cricket ground. He then developed a flexible instrument capable of light transmission that led to the development of flexible endoscopes.

In 1957 he was asked to develop a better cystoscope. The answer was the rod lens system. His work resulted in far better light and image transmission. He offered this system to several American and British companies who did not show any interest in it. A German manufacturer, Karl Storz, recognised the potential and combined the rod lens system with his 'cold light' and transformed his small company into the international one, we know today. Hopkins received many prestigious awards and was nominated for the Nobel Prize. He was a gifted linguist and musician. He died at the age of 77.

Conclusions: Hopkins was a genius whose inventions have revolutionised diagnostic and therapeutic endoscopy.

U 18

Urine therapy: from the ancient remedy of Shivambu Kalpa to modern times

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Introduction: Urine therapy refers to the ingestion or application of human urine for medicinal or cosmetic purposes. The aim of this study is to research the evolution of urine therapy from its origin to its modern day use.

Material and Methods: A comprehensive review was performed using PubMed and the internet using the search terms "urine therapy", "urotherapy" and "shivambu". In addition some books and pamphlets on the subject were reviewed.

Result: The first documented evidence of urine therapy appears to originate from ancient India, known as Shivambu Kalpa. In some parts of ancient China the urine of young boys was thought to protect the skin. In the 17th century the French female aristocracy bathed in their own urine as they felt it beautified skin. Since then ingestion of urine has claimed to have cured many diseases including cancer, diabetes, arthritis, heart disease, leprosy, gangrene and allergy to name but a few. No scientific studies have proven its benefit in treating disease.

Conclusion: Today advocates of urine therapy state many beneficial effects including treating disease but also in maintaining health. Critics will argue that urine contains the bodies waste products and that scientific evidence of benefit is lacking.

U 19

Fascinating history of evolution of the understanding of human fertilisation!

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Introduction: Before the 19th century how fertilisation took place, and the respective roles played by male, and female were poorly understood! The intellectuals were mystified by this aspect of nature. The objective of this study is to provide a glimpse of interesting concepts that prevailed.

Methods: Search for pertinent primary and secondary sources was undertaken using internet and library sources.

Results: In 17th century, embodiment theories were prominent. These contended that each organism develops from a homunculus or tiny version of an adult inside a sperm, the embryo being already preformed in the ovary. William Harvey subscribed to ovism or epigenesis, attributing a key role to the female egg. The 'preformationism' versus 'epigenesis' disputed into the 18th century. The most refined embryological study came from KF Wolff (Wolffian duct fame). His thesis, theory of generation (1759) gave a death blow to preformation. He recognised that every person develops from an egg to a complete individual. Religious groups criticised him. The great embryologist Von Baer (1792-1876) refined his work. He discovered the ovum and proposed the 'biogenetic law' which was close to modern germ cell theory.

Conclusions: In 19th century embryology became one of the fundamental building blocks of biology.

U 20

Sir Harold Gillies: pioneer of phalloplasty

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Introduction: Sir Harold Gillies is widely considered the father of plastic surgery. He performed a series of operations on Michael Dillon, completing the world's first gender reassignment procedure. We examine the technical, psychological and social challenges Gillies faced in pioneering phalloplasty.

Methods: Time related sources in medical and historical literature were reviewed from the Royal College of Surgeons of England and the Royal Society of Medicine, London.

Results: During his career, Gillies reconstructed penises in soldiers with blast injuries and operated on ambiguous genitalia. His drive to perform a complete phalloplasty was however delayed by the influx of World War II injuries. It was in 1946 when British physician Laurence Michael Dillon (born Laura Maude Dillon) who felt "not truly a woman" consulted Gillies. A series of thirteen operations spanning four years culminated in the transformation of his external genitalia. This was the first female to male transsexual procedure. Gillies went onto perfect his technique and subsequently

performed the first female to male reassignment procedure using a flap technique that remained standard for forty years.

Conclusions: Despite ethical protest and media sensation, Sir Harold Gillies's phalloplasty was a unique and pivotal procedure culminating in the birth of modern uroplastic surgery.

U 21

Poison to prescription: a history of botulinum toxin in medicine

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Introduction: Over the last thirty years botulinum toxins have emerged as a formidable weapon in the physician's armament. Amongst its many applications it has found a niche role in urology, most notably as a treatment for the overactive bladder. We describe its evolution from fatal poison to modern prescription medicine.

Methods: We conducted a PubMed literature review and internet search to identify sources charting the history and application of these fascinating toxins.

Results: Botulism was first described in detail by Justinus Kerner in the early nineteenth century. He accurately documented the symptoms of the "sausage poison", which when attenuated are seen to produce the therapeutic effects desired today. Emile van Ermengem identified the clostridia bacteria in 1896, whilst H Sommer isolated the toxin in 1928. The blockade of acetylcholine was described by Burgen et al in 1949 but it was not until 1981 that Scott et al first described the use of the toxin in humans as a treatment of strabismus. In urology it has proving invaluable in the management of DSSD, overactive bladders and more recently BPH.

Conclusion: Botulinum toxin has evolved from a potent, often fatal neurotoxin into an indispensable tool of modern medicine and urology.

U 22

John Hunter (1728–1793) and the birth of scientific urology

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Introduction: John Hunter is considered to be the father of comparative anatomy and experimental (scientific) surgery. Hunter allowed the advancement of surgery as a scientific discipline by testing his theories as

they arose and his contribution to urological surgery, in particular, is immense.

Methods: He was the first to describe the importance of androgens in prostatic development and proved this by the dissection of castrated male animals. His work also described bladder outflow obstruction from occlusive prostates, the gubernaculum, testicular descent, and the potential for artificial insemination.

Results: Hunter described many common urological pathologies including the hydrocele, renal calculi, urogenital fistulas, gonococcal urethritis, infective cystitis, and syphilis. He proposed the infective theory for

the aetiology of most urethral strictures, recommended urethral dilatations and successfully performed external urethrotomy. As a pupil of Cheselden, Hunter was also a swift and skillful perineal lithotomist.

Conclusions: Hunter believed surgery should be governed by scientific principles, which were based on reasoning, observation, and experimentation. His straightforward technique of experimental trials of his theories reaped huge rewards in the advancement of urological surgery. He looked at what was in front of him, tested it and interpreted it in the context of current surgical knowledge.