

Narrowings and the "McDonald Jet Sign"

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Abstract

The so-called "jet sign" was first brought to my attention in 1981 by the late Dr. McDonald as a diagnostic sign of urethral stricture. It is a jet of dye starting at the stricture and spraying into the bladder. It was observed on roentgenograms following retrograde urethrography. Some characteristic roentgenograms have already been published with a short clinical description. It is befitting, now that Dr. McDonald has passed away, to name the jet sign after him, and henceforth call it the "McDonald jet sign".

More recently we saw the "McDonald jet sign" on retrograde pyelograms in patients who had uretero-pelvic junction obstruction. The jet sign seems to be much more frequent than had been suspected and can be seen in several conditions where the contrast material is injected across a narrowed passage, as it sometimes happens in urograms with a narrowed ureteral orifice.

Key words: Urethral stricture, urethral narrowing, urethrography, prostatic cancer, uretero-pelvic junction obstruction, 'jet sign'

The so-called "jet sign" was first brought to my attention in 1981 by the late Dr. J.H. McDonald who considered it a diagnostic sign of urethral stricture. The sign was observed on roentgenograms following retrograde urethrograms in patients who have a urethral stricture; it consists of a jet of dye seen to be starting at the stricture and spraying into the bladder.

Since 1981, we have observed this sign on several occasions on the retrograde urethrograms (obtained by the injection of about 25 ml of an undiluted solution of 60% iohalamate meglumine) of a number of patients who had a urethral stricture or a bladder neck contracture.¹

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Case 1

DWL is a 72 year-old hypertensive diabetic who, 10 years previously, had a grade 1-2 cancer of the prostate which was treated by pelvic node dissection and radiotherapy in 1979. A urethrogram made in 1982 showed a very narrow urethra and the jet sign (Figure 1). The urethral stricture was so tight that it had to be dilated with filiforms under general anesthesia. He was subsequently treated with repeated dilatations until 1983. In 1987 he developed a left deep venous thrombosis which was treated with heparin and coumadin. The PAP was 0.8 in 1988 and the PSA 1.1.

Case 2

RE is a 61 year-old white male whose prostatic biopsy revealed an adenocarcinoma of the prostate, Gleason pattern 3-4. He underwent a radical prostatectomy; the specimen showed perineural invasion. A urethrogram performed nine months later showed the jet sign (Figure 2); a perineal needle biopsy showed cancer recurrence. The prostatic urethra was narrowed by the cancer.

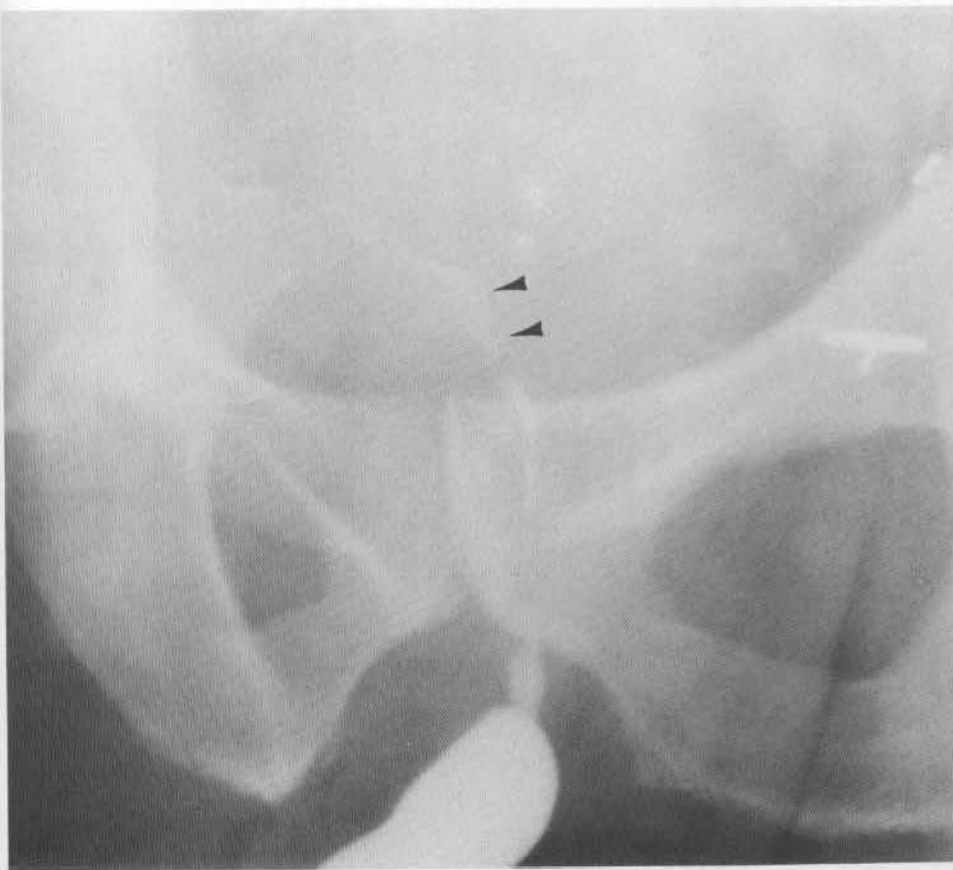


Figure 1. Jet sign on retrograde urethrogram of case 1 who had a severe urethral stricture.

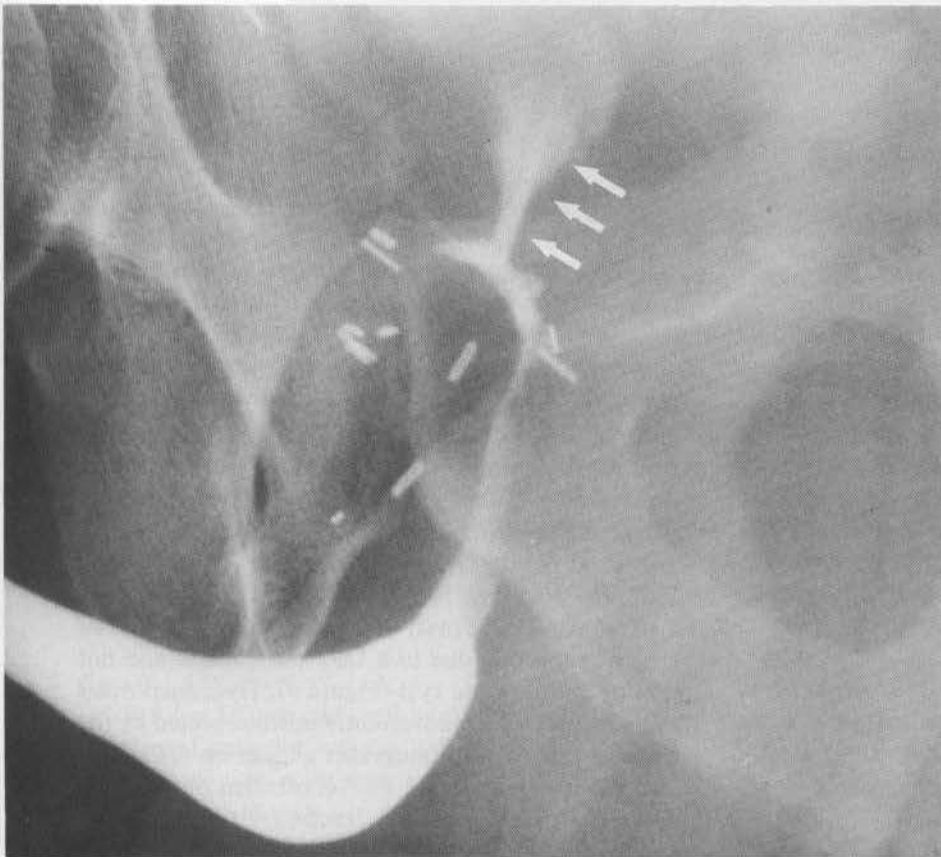


Figure 2. Jet sign from narrowing of the bladder outlet after radical prostatectomy (case 2).

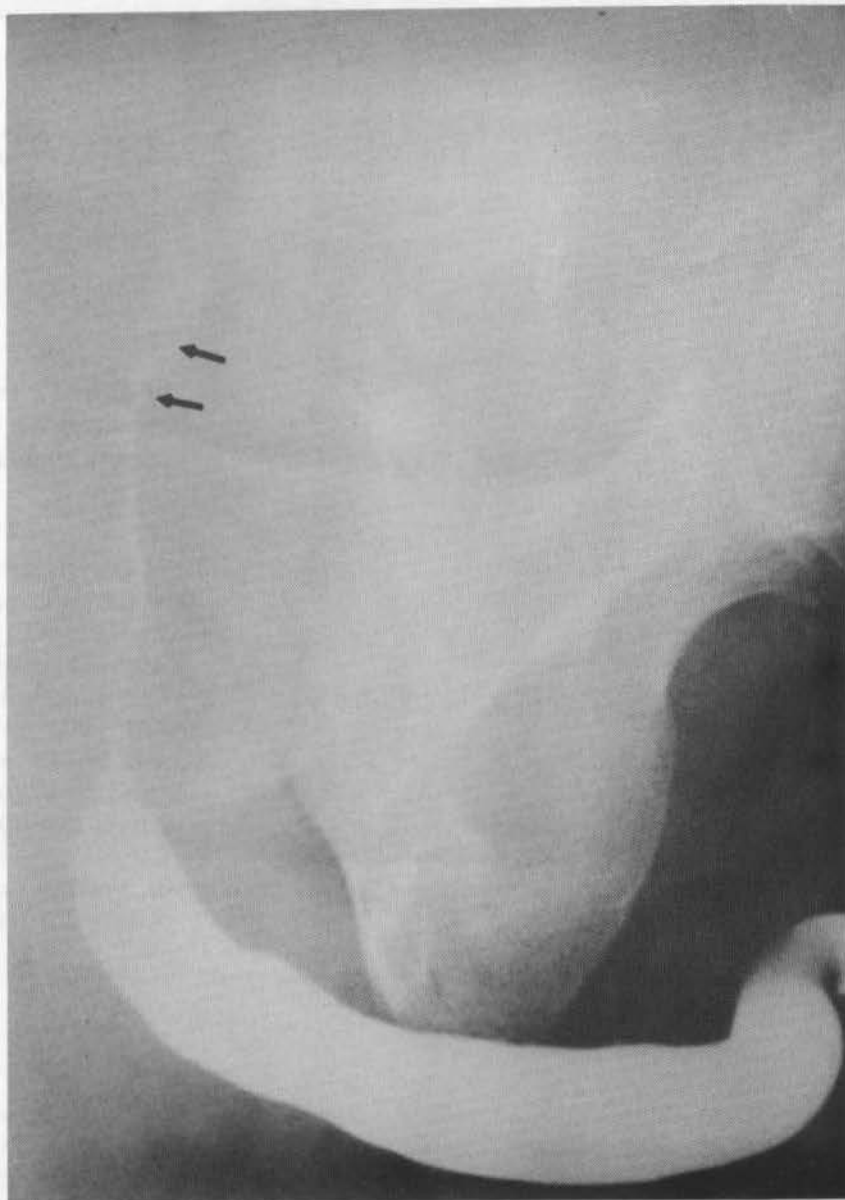


Figure 3. Jet sign seen on retrograde urethrogram (Case 4).

Case 3

PJS is 67 year-old male who had an accident in 1961 and underwent a urethral anastomosis. He developed atrial fibrillation in 1986 and was put on coumadin. A retrograde urethrogram showed the jet sign as well as filling of the seminal vesicle. In 1987, an internal optic urethrotomy was performed and subsequently he underwent repeated urethral dilations.

Case 4

EDM was born in 1921 and suffered from rheumatoid arthritis. He was on steroids. A retrograde urethrogram shows the jet sign (Figure 3).

Case 5

LOGjr is a 26 year-old male of mexican extraction

who was complaining of attacks of progressively worsening right upper quadrant and right flank colicky pain for approximately 7 years; each attack would last a number of hours. An ultrasonogram showed a 7 x 10 cms parapelvic cyst. After voiding, a repeat ultrasonogram revealed that the cyst had decreased in size from 7 to 2.5 cms. A CT done in 1983 was described by the radiologist as showing a 7 x 10 cm parapelvic cyst; in fact the image was that of a hydronephrosis due to a UPJ obstruction and not that of a parapelvic cyst (Figure 4). Hydronephrosis can sometimes be inadvertently misinterpreted by the roentgenologist, on sonograms and/or on CT scans, as a parapelvic cyst. An IVP confirmed our impression of right UPJ obstruction. A retrograde pyelography performed in October 1983 with an 8F cone-tipped catheter showed a UPJ obstruction with



Figure 4. Right hydronephrosis from a UPJ obstruction (Case 5).

the jet sign (Figure 5); the catheter was withdrawn and a 4F olive tip catheter was introduced into the right ureter up to 26 cms where it met an obstruction. The patient underwent a resection of the congenitally narrowed ureter, a pyeloplasty and a nephropexy.

Case 6

JWG is a 66 year-old diabetic patient (blood sugar 176-375 mg %) on oral antidiabetic medication who complained of impotence; his penile brachial pressure index was 1. A Barrett's oesophagus with erosions was diagnosed. A right retrograde pyelogram showed a partial right UPJ obstruction and the jet sign (Figure 6) with delayed but adequate drainage on catheter pull out. In 1988, he had a weak urinary stream, his flow rate was 5/9, the residual urine was 175 ml and, on cystometrography he was found to have a neuropathic bladder. Twelve grams of benign prostatic tissue were endoscopically resected.

Case 7

CWR is a 66 year-old male who complained of dull right renal pain for 8 years. IVP showed a delayed function of the right kidney. A right retrograde pyelography showed a right UPJ obstruction with hydronephrosis, some malrotation of the kidney and the jet sign (Figure 7).

Discussion

The jet phenomenon was originally described, as early as 1955, as a rare curiosity seen in two IVPs, as a prolongation of the ureter into the bladder; it was thought, at that time, that it could occur in normal ureteral orifices.² Later McDonald described it in retrograde urethrograms as a sign of urethral stricture. Dr. J.H. McDonald did not have the occasion to publish his observation; but some of the characteristic roentgenograms which we obtained and which show the jet sign, have already been published with a short clinical description.¹ It is befitting, now that Dr. McDonald has passed away, to name the jet sign after him, and henceforth call it the "McDonald jet sign".

The "jet sign" seen on the roentgenogram seems to be produced by the forceful injection of the radio-opaque contrast medium across the strictured and/or narrowed portion of the urethra, as the contrast medium forcefully enters the non-opacified urine in the bladder. It can only be seen if the roentgen exposure is made at the exact time the dye is injected.

We found that the jet sign was also observable in other conditions, such as urethral narrowing from prostatic cancer (case 2) and bladder neck contraction.

The jet sign may not be sufficient to differentiate between the various causes of urethral narrowing,



Figure 5. Jet sign seen on the retrograde pyelogram of case 5 due to UPJ obstruction.

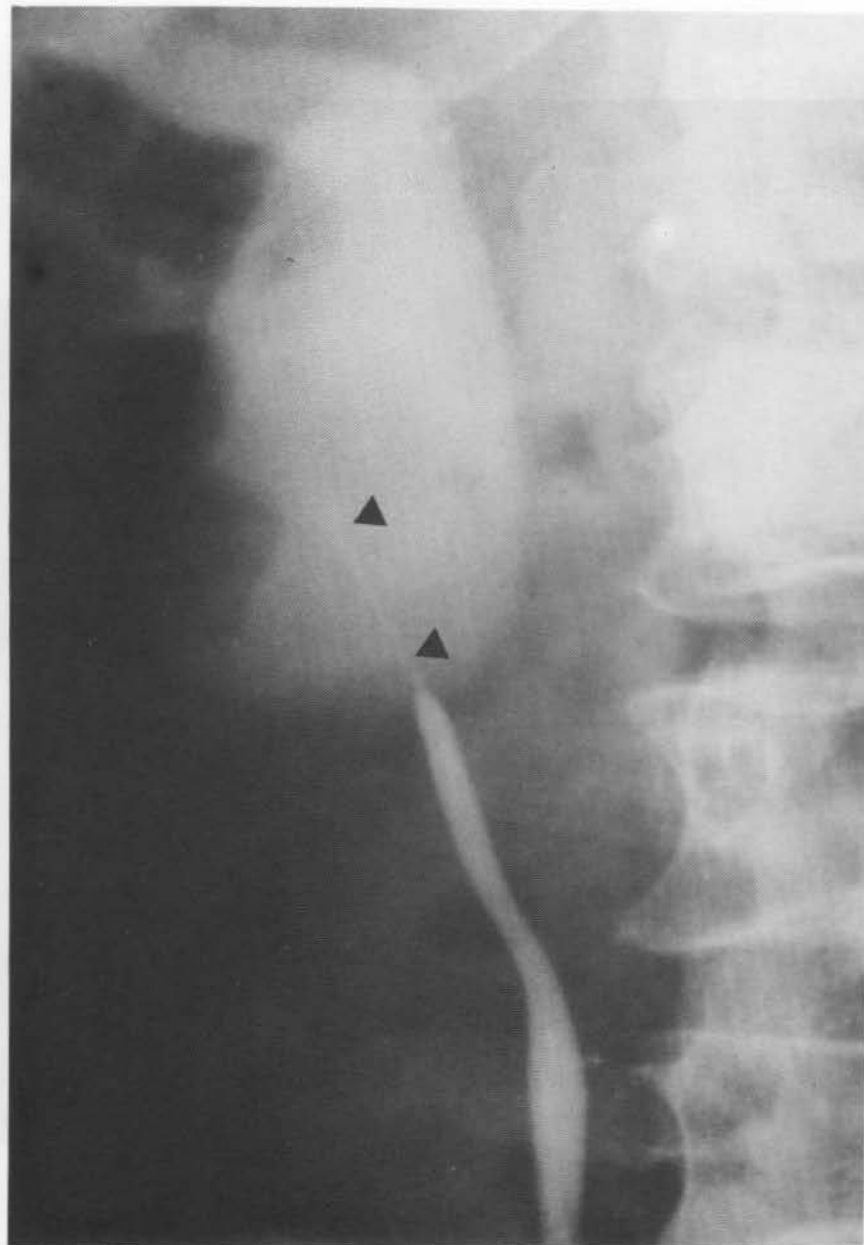


Figure 6. Jet sign seen on right retrograde pyelography in case 6 due to UPJ obstruction.



Figure 7. Faint jet sign seen after retrograde pyelography in case 7, due to UPJ obstruction.

but it usually indicates that the urethra has a narrowing that needs further investigation.

More recently we saw the "McDonald jet sign" on the retrograde pyelogram in 3 patients who had a uretero-pelvic junction (UPJ) obstruction (cases 5, 6, and 7).

This concept could well be extended to include other roentgenographic situations where a narrowing does exist. Although we have not seen it, there is a possibility that the jet sign could also be seen, under

propitious circumstances, in arteriograms with arterial narrowing.

References

1. Haddad FS: Acquired urethral strictures In: Kovac A, Haddad FS, eds, Guide to diagnostic imaging. New York: Medical Examination Publishing Company, Inc., vol 5, 1984; 218-223.
2. Kalmon EH, Albers DD, Hartwell DJ: Ureteral jet phenomenon. Radiology 1955; 65:933-5.