ENDOSCOPIC MANAGEMENT OF VESICOURETERAL REFLUX

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INTRODUCTION

- 0.4-1.8% of healthy children
- 30-50% of children with a febrile UTI.
- It is agreed that treatment of VUR should be performed to minimize the risk of febrile urinary UTIs that may result in renal scarring and its sequelae.
PARADIGM SHIFT

PRIOR TO FDA APPROVAL; SURGICAL INTERVENTION:

1 - HIGH-GRADE VUR,

2 - BREAKTHROUGH INFECTIONS,

3 - EVIDENCE OF RENAL SCARRING, OR

4 - PARENTAL PREFERENCE.
PARADIGM SHIFT

• 288% INCREASE IN THE NUMBER OF DXHA INJECTIONS

• FROM 2002 TO 2004

• THE NUMBER OF OPEN REIMPLANTATIONS REMAINED STABLE.
INTRODUCTION

• **MATOUSCHEK (1981)** first described the injection of polytetrafluoroethylene (PTFE).

• **O’DONNELL AND PURI (1986)** popularized the technique when they published their initial report on the successful endoscopic correction of primary VUR in 103 ureters with a success rate of 75% after one injection. They coined the term Sting (Subureteric Teflon Injection).

• **This injection changes the angle and perhaps fixation of the intravesical junction, thereby correcting reflux.**
AGENTS USED FOR ENDOSCOPIC CORRECTION OF VESICOURETERAL REFLUX

- NONAUTOLOGOUS MATERIALS
  - POLYTETRAFLUOROETHYLENE (PTFE)
  - CROSS-LINKED BOVINE COLLAGEN
  - POLYDIMETHYLSILOXANE
  - DEXTRANOMER HYALURONIC COPOLYMER (DEFLUX)
  - COAPTITE

- AUTOLOGOUS MATERIALS
  - CHONDROCYTES
  - FAT
  - COLLAGEN
  - MUSCLE
EVOLUTION OF THE HYDRODISTENTION IMPLANTATION TECHNIQUE (HIT)

• BOTH PROXIMAL AND DISTAL INTRA-URETERIC INJECTION (DOUBLE HIT) TO ACHIEVE BETTER COAPTATION OF THE INTRAMURAL TUNNEL.

• INITIAL INJECTION (PROXIMAL HIT) SHOULD IMPINGE THE FLOOR OF THE MID-URETERAL TUNNEL AT THE 6 O’CLOCK POSITION.

• SHOULD LEAD TO COAPTATION OF THE PROXIMAL URETERIC TUNNEL
HIT

• **THE DISTAL HIT** IS PERFORMED BY PLACING THE NEEDLE TO THE SAME DEPTH JUST WITHIN THE URETERAL ORIFICE

• THE END RESULT IS A ‘MOUNTAIN-RANGE’ APPEARANCE OF THE TUNNEL AND ORIFICE.

• IF ADEQUATE COAPTATION OF THE URETERAL ORIFICE IS NOT ACHIEVED FOLLOWING THE TWO INTRA-URETERIC INJECTIONS THEN A CLASSIC STING INJECTION IS PERFORMED.

• **93% URETERAL CURE RATE WITH ONLY A SINGLE TREATMENT.**

• **VOLUME 1.3 ML.**
Figure 5  Optimal appearance of double HIT injection. The ureteral tunnel and orifice are completely coapted with a 'mountain-range' formation. The orifice orients on top of the mound with a loss of hydrodistension.
Figure 4  Endoscopic injection needle placement algorithm. Numbers indicate the order of the injection sites. Sites 1 and 2 represent the double HIT method which is used in nearly all cases as the primary approach. Site 3 is uncommonly used and site 4, a method of last resort, is only used rarely in complex cases.
Figure 6  Comparison of success rate between endoscopic injection techniques and DxHA.
LEARNING CURVE

• 85% RESOLUTION RATE AFTER 50 PATIENTS, A RATE THAT REMAINED STEADY FOR THE NEXT 50 PATIENTS THAT WERE TREATED BY ENDOSCOPIC INJECTION OF DXHA
TREATMENT OF COMPLEX CASES OF VUR

- LACKGRENN: 83% SUCCESS RATE IN CHILDREN TREATED WITH BLADDER DYSFUNCTION, FINDING NO SIGNIFICANT DIFFERENCE BETWEEN THE SUCCESS RATES OF CHILDREN WITH OR WITHOUT VOIDING DYSFUNCTION.

- VOIDING DYSFUNCTION RESOLVED IN 59% OF THE CHILDREN TREATED WITH DXHA, QUESTIONING THE CAUSAL RELATIONSHIP BETWEEN VOIDING DYSFUNCTION AND VUR.
TREATMENT OF COMPLEX CASES OF VUR

• SIMILAR TO LACKGREN ET AL., WE FOUND A 44% IMPROVEMENT IN INCONTINENCE AND VOIDING PATTERN IN PATIENTS WITH NON-NEUROGENIC VOIDING DYSFUNCTION.

• 80% SUCCESS RATE IN MORE THAN 60 PATIENTS WITH DUPLICATED SYSTEMS
TREATMENT OF COMPLEX CASES OF VUR

• IN OUR LAST 200 PATIENTS WE HAVE DEMONSTRATED NO SIGNIFICANT DIFFERENCE IN SUCCESS RATES BETWEEN GRADES I-IV REFLUXING URETERS, WITH AN OVERALL SUCCESS RATE OF OVER 90%. OF NOTE, OUR HIGHEST SUCCESS RATE IS WITH THE TREATMENT OF GRADE IV URETERS (96% SUCCESS).

• THIS IS MOST LIKELY DUE TO THE FACT THAT MOST OF THESE URETERS ARE EASILY HYDRODISTENDED AND REPRESENT AN EASIER TARGET FOR ENDOSCOPIC INJECTION.
TREATMENT OF COMPLEX CASES OF VUR

• 81% SUCCESS RATE IN THE TREATMENT OF REFLUXING URETERS ASSOCIATED WITH PARAURETERAL DIVERTICULA.

• USE OF DXHA FOR THE TREATMENT OF PERSISTENT VUR FOLLOWING OPEN URETERAL REIMPLANTATION. SUCCESS RATES: 83% TO 100%.
NEW CONTRALATERAL REFLUX

- BETWEEN 10% AND 32%.

- THE EXACT MECHANISM RESPONSIBLE IS UNCLEAR, BUT IT HAS BEEN THOUGHT TO BE RELATED TO

1. DISTORTION OF THE TRIGONE OR

2. ELIMINATION OF A POP-OFF MECHANISM THAT PREVIOUSLY MASKED A REFLUXING URETER.
NEW CONTRALATERAL REFLUX

• SPONTANEOUSLY RESOLVES IN APPROXIMATELY TWO-THIRDS OF PATIENTS BY 2 YEARS.

• THERE WAS NO SIGNIFICANT RELATIONSHIP BETWEEN RATE AND REFLUX GRADE.

• FEMALES YOUNGER THAN 5 YEARS
NEW CONTRALATERAL REFLUX

• 73% OF URETERS THAT DEVELOPED NEW CONTRALATERAL REFLUX FOLLOWING ENDOSCOPIC TREATMENT COULD BE HYDRODISTENDED SUCH THAT THE URETERIC TUNNEL OR EXTRAVESICAL URETER COULD BE VISUALIZED.

• CURRENTLY, AS PART OF A PROSPECTIVE STUDY, WE ARE USING HYDRODISTENTION OF THE CONTRALATERAL URETER TO DETERMINE WHICH URETERS TO TREAT.
PREVENTION OF FEBRILE UTI

• URETERAL REIMPLANTATION HAS BEEN ASSOCIATED WITH A FEBRILE UTI RATE OF 25-40% IN SUCCESSFULLY TREATED PATIENTS.

• OVERALL CYSTITIS RATE OF 6% AND FEBRILE UTI RATE OF 0.75% FOLLOWING ENDOSCOPIC TREATMENT.
PREVENTION OF FEBRILE UTI

• RATE OF UTI WAS HIGHER IN THE REIMPLANT GROUP COMPARED TO THE DXHA GROUP (38% VS 15%).

• RATE OF FEBRILE UTI WAS HIGHER FOR THE REIMPLANT GROUP (24%) COMPARED TO THOSE WHO UNDERWENT ENDOSCOPIC TREATMENT (5%).
SUCCESS RATE

- GRADE 1 → 89%
- GRADE 2 → 83%
- GRADE 3 → 71%
- GRADE 4 → 59%
- GRADE 5 → 62%
- OVERALL DELAYED FAILURE 5-25%
- SUCCESS RATE OF SECOND PROCEDURE AFTER INITIAL FAILURE → 70-90%
- SUCCESS RATE AFTER OPEN PROCEDURE FAILURE → 65%
ENDOSCOPIC FAILURES

• THE MECHANISM FOR DXHA FAILURE IS UNCLEAR AND MAY BE MULTIFACTORIAL.

• THE ACCURACY OF THE NEEDLE ENTRY POINT AND NEEDLE PLACEMENT IS AN IMPORTANT COMPONENT FOR SUCCESS OF THE PROCEDURE
ENDOSCOPIC FAILURES

• INCREASING REFLUX GRADE, HIGHER INJECTED VOLUMES AND FAILURE TO CREATE A SATISFACTORY MOUND WERE RELATED TO DXHA FAILURES

• THE PRESENCE OF A PERFECT MOUND DOES NOT PREDICT SUCCESS

• IN MOST OF OUR FAILURES WE HAVE FOUND CAUDAL MIGRATION
ENDOSCOPIC FAILURES

• WE BELIEVE THAT MOST FAILURES ARE DUE TO TECHNICAL ERRORS: THE TECHNIQUE FOR INJECTION (INTRA-URETERIC, SUBMUCOSAL) AND A MEANS OF DETERMINING THE ENDPOINT OF INJECTION (LOSS OF HYDRODISTENTION AND THE CREATION OF A MOUNTAIN RANGE RATHER THAN A MOUND).

• POSTOPERATIVELY FAILURE: DISPLACEMENT (MOST OFTEN CAUDALLY), DISRUPTION (BLEB LOSS OF MATERIAL THROUGH A MUCOSAL BREACH) AND DISSOLUTION (DECREASE IN PERCENTAGE OF THE VOLUME RETAINED POSTINJECTION MEASURED SONOGRAPHICALLY).

• WHILE TECHNICAL FAILURE CAN BE AVOIDED, THE LATTER THREE MECHANISMS MAY BE INESCAPABLE.
ENDOSCOPIC FAILURES

• With the evolution of the Hit Method, we have found our success rate with repeat injection to be 90%.

• It appears that open surgical treatment should be strongly considered for those who have had a second DXHA failure.

• Salvage ureteral reimplants can be performed effectively and without added difficulty.
POSTOPERATIVE URETERAL OBSTRUCTION

• LESS THAN 1%
CONCLUSION

• IN OUR OPINION, OPEN REIMPLANTATION SHOULD BE RESERVED FOR THOSE CHILDREN WITH 1- ECTOPIC URETERS, 2- MEGAURETERS THAT REQUIRE TAPERING, 3- SECONDARY GRADE V VUR AND 4- THOSE CHILDREN WHO HAVE FAILED TWO ENDOSCOPIC INJECTIONS.