
This paper articulates a new paradigm for managing children with spina bifida using clean intermittent catheterization and anticholinergics with surveillance based on the leak point pressure concept. These methods were pioneered here in Ann Arbor and this paper illustrates the best outcomes reported in terms of preservation of upper urinary tract structure and function.


This paper was the largest report of an experience of a common but generally misunderstood and over-investigated pediatric difficulty which we named, “Extraordinary urinary frequency.” Jerri Zoubek was the resident who collected the data. The idea for the paper, the writing of the paper, and the patient base were all my contribution. Aileen Sedman was my pediatric nephrology colleague who helped with the manuscript and design of our study. As a result of this paper, this terminology is generally used for this problem and the management follows the guidelines herein reported.


This paper showed that lessening of outlet resistance in children with spina bifida provides a durable improvement in bladder compliance. This data had a somewhat serendipitous origin. We had shown that urethral dilation lowers leak point pressure in children with myelomeningocele (paper #21) and a few years later we decided, for the fun of it, to see how the calculated initial detrusor compliance changed immediately and late after the dilation. The outlet resistance and long term detrusor characteristics were discovered to be linked inextricably. This data leaves one to speculate that the end stage bladder of myelodysplasia may be a pathophysiologic situation similar to that seen in posterior urethral valves and benign prostatic hyperplasia. Citation survey: cited references 16, times cited 27.


This was the first use of laparoscopy in the urological arena for a therapeutic procedure.


The Holter Shunt is a cardinal tool for management of children with spina bifida. John Holter, an industrial technician, innovated the shunt for use in his own child in the 1950’s. The first author of our paper, Josh Baru, was an undergraduate student we sent to interview John Holter in Pennsylvania and collect materials for this work. The idea for the paper was mine and I shared the design and writing of the paper with Josh. Karin Muraszko is our pediatric neurosurgeon who provided critical background necessary for this paper. C. Everett Koop had been Chief of Staff at the hospital in which the shunt was first used and helped us not only with some factual information and insights but also with the final proofreading of the manuscript.