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CORRELATION BETWEEN URODYNAMIC FUNCTION AND 3-D CAT SCAN ANATOMY IN NEOBLADDERS: DOES IT EXIST?

Hypothesis / aims of study
We compared the functional and anatomical differences among 3 different orthotopic bladder substitutes, as defined by urodynamic and images collected using multidetector row CT (MDCT) with subsequent 3D and multiplanar reconstructions.

Study design, materials and methods
Between June 1995 to February 2002 on a total of 102 patients who undergone a radical cystectomy with a continent orthotopic diversion, 34 were able to participate in the evaluation of their respective neobladder by 3 – D CT and video urodynamics. Three different types of orthotopic neobladder reconstruction were identified (I: ileal, IC: ileocecal, S: sigmoid). There were 7 ileocecal, 15 sigmoid and 12 ileal neobladders. The populations studied were all greater than 12 months post surgery. Multiple anatomic parameters provided by 3-D CT and urodynamic variables were measured. This data has never previously been published.
The following measurements and observations were obtained from the reconstructed CT images: the distance from the center of the neobladder to the symphysis (DPS), to the coccygeal line (DC), distance of neobladder wall to the femoral head bilaterally (DRF,DLF), the neobladder volume (V), the sphericity (SP), the neovesical-urethral angle (NVUA), assessment for the presence of neocystocele (CYS), recesses (R), internal folds (IF), reflux (RE), and the thickness of the neobladder wall (TH).
The following functional data were obtained from the urodynamic exam: stress incontinence, maximal capacity (maxC), pressure at the maximal capacity (PmC), maximal flow (maxQ), pressure at the maximal flow (PmQ), Valsalva leak point pressure (VLPP), post voidal residual (PVR).
Statistical analysis for this study employed a linear regression test and an odds ratio calculation (using StatSoft V. 5.1).

Results
In comparing of the 3 different neobladders, no significant difference in incontinence rates, post void residual or neobladder capacity (maxC 431-524 ml) were noted. Radiographically, there is a statistical difference regarding the presence of internal folds between S and I, as well as the thickness of the wall between I and IC. Looking at the entire population, the following association was statistically significant: the maxC and the V, the PmQ and the DPS (linear correlation), the PmQ and the TH (linear correlation), the PmC and the DPS (linear correlation), the maxQ and DLF (inverse correlation), the PVR and the DLF (linear correlation), the PVR and the DC. The Odds ratio calculation revealed (with significant $p<0.05$) that the further the center of the neobladder is from the right femoral head, the higher risk of incontinence. None of the other radiological data were associated with incontinence. The center position of the neobladder was on average significantly moved toward the right of the anatomic pelvic center, considering the midpoint to be a line between the two femoral heads.

Interpretation of results
Our first aim was to question whether any of the three orthotopic neobladders had any functional or anatomical significant differences when viewed by urodynamics and 3D CT scan. We did not find any substantial differences with regard to all the functional and morphological data. This is in distinction from others (2,3)
The comparison among radiological and functional data showed us some interesting aspects. First, the PmC,PmQ and the DPS showed a statistically significant linear correlation. This indicates that the further the neobladder is from the pubic symphysis, the higher the PmC and the PmQ are. This data may be explained by the higher pressure that the rectus muscle can produce on the neobladder if it is closer to the center of the pelvis than to the pubis. In accordance with this explanation, we have the linear association among the DC and the PVR. In other words, the further the neobladder is from the coccyx, the higher is the PVR. It looks like if the neobladder is close to the pubic symphisis, the abdominal pressure is not able to create a satisfactory PmC and PmQ in order to completely void the neobladder itself. On the latero-lateral plane it is interesting to notice the linear correlation between incontinence and DRF. In addition, PVR and the DLF,are linearly related as is the relationship of the Max Q and DLF. According to this data, neobladder distance from the right femur head stongly suggests an increase risk of incontinence , on the other side the further the neobladder is from the left femur, more diminished stream and lower Q Max and higher PVR.

In summary:
1. The more the neobladder is far away from the pubic symphisis the higher the PmC and the PmQ are.
2. The more the neobladder is far away from the coccix the higher the PVR is.
3. The more the center of the neobladder is distant from the right femur head, the higher the risk of incontinence is.
4. The more the neobladder is distant from the left femur the less is the Q Max and the higher is the PVR.

On a theoretical point of view we could describe a possible “Incontinence/High pressure pelvic area” located in the left-posterior part of the pelvis.

Concluding message
The study seems to show no significant anatomical or functional difference among the three different types of neobladders. A correlation between the position of the neobladder and urinary incontinence is suggested, recognizing further study in a larger population is required.

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Was this study approved by an ethics committee?	**Yes**

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Was the Declaration of Helsinki followed?	**Yes**
Was informed consent obtained from the patients?	**Yes**