Changes in Collagen Type 3, Elastin, Fibrosis and Cajal Cell in Congenital Ureteropelvic Junction Obstruction

Üreteropelvik Bileşke Obstrüksyonunda; Kollajen Tip 3, Elastin, Fibrozis ve Cajal Hücrelerindeki Değişiklikler

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ABSTRACT

Objective
To compare changes in collagen type 3, elastin, fibrosis and cajal cells through histopathological examination of the ureteropelvic junction (UPJ) segments of pediatric and adult patients who had undergone Anderson-Hynes pyeloplasty for ureteropelvic junction obstruction (UPJO).

Materials and Methods
Histopathological evaluation was made of the UPJ segments of 52 patients who underwent Anderson-Hynes pyeloplasty for UPJO between January 2005 and January 2008. Patients were separated into 2 groups as pediatric, aged ≤15 years (group 1, n=10) and adult, aged ≥15 years (group 2, n=42). UPJ segments of both groups were compared histopathologically (collagen type 3, elastin, fibrosis and cajal cells). Radiographic evaluations were made with diuretic renogram and/or intravenous pyelography.

Results
Mean age of group 1 patients was 8.12±2.6 years (1-12 years) and of group 2 patients, 38.16±5.91 years (16-62 years). Mean follow-up period was 18 months (9-24 months). No statistically significant difference was determined between the groups in respect of collagen type 3, elastin, fibrosis or cajal cells (p>0.05).

Conclusion
As the pathology in the UPJ obstruction is a congenital defect, the histopathology does not change with age.

Key Words
Ureteropelvic junction obstruction, histopathology, pediatric, adult

ÖZET

Amaç
Üreteropelvik bileşke darlığı (ÜPBD) nedeniyle Anderson-Hynes pyeloplasti yapılan pediatric ve erişkin hastaların üreteropelvik bileşke (ÜPB) segmentlerini histopatolojik olarak incelerek ve bu hastalarda; kollajen tip 3, elastin, fibrozis ve cajal hücrelerindeki değişiklikleri karşılaştırırmak.

Gereç ve Yöntem

Bulgular
Hastaların ortalaması yaş: grup 1 için, 8,12±2,6 (1-12 yıl), grup 2 için, 38,16±5,91 (16-62 yıl) idi. Ortalama takip süresi 18 ay (9-24 ay) idi. Gruplar karışıtmışsa da; kollajen tip 3, elastin, fibrozis ve cajal hücrelerinde istatistiksel fark yoktu (p>0,05).

Sonuç
ÜPBD’de, üreteropelvik bileşkedeki patoloji doğumsal bir defekt olup, yaşla birlikte histopatoloji değişmez.

Anahtar Kelimeler
Üreteropelvik bileşke darlığı, cajal hücreleri, elastin, kollajen tip 3, fibrozis, pediatric, erişkin

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Introduction

In children, ureteropelvic junction obstruction (UPJO) is the most frequently seen cause of urinary tract obstruction, seen at the rate of 1/1000-1/2000 births (1). The cause of the pathology in UPJO remains unclear despite embryological (2), anatomical (3), functional (4) and histological (5) research. In the histopathological evaluation of UPJ, a reduction in smooth muscle cells, an accumulation of abnormal collagen and a reduction in cajal cells and neuronal elements have been determined (6,7). It is not fully understood whether these histopathological changes are present from birth and result in UPJO or whether the histopathological changes in this region develop later, associated with a mechanical obstruction. In this study, it was attempted to explain this situation by histopathological comparison of UPJ segments excised from paediatric and adult patients.

Materials and Methods

The study comprised 52 patients who underwent pyeloplasty for UPJO in our clinic between 2005 and 2008. Patients were excluded if the obstruction was associated with extrinsic causes such as aberrant vascular pressure or peri-ureteral fibrosis. The patients were separated into 2 groups as paediatric, aged ≤15 years (group 1, n=10) and adult, aged >15 years (group 2, n=42). The UPJ segments of both groups were compared histopathologically (collagen type 3, elastin, fibrosis and cajal cells). Preoperative evaluations were applied to all cases with diuretic renogram and/or intravenous pyelography. Anderson-Hynes pyeloplasty was applied to all patients.

Pathological Evaluation

All excised UPJ segments were examined at Pathology Lab. Sections 4 μm thick were obtained from formalin-fixed paraffin blocks, stained with hematoxylin & eosin, and examined under a light microscope. Reticulin and Masson’s trichrome staining was performed to determine collagen type 3 status in the submucosa and the presence of fibrosis.

Immunohistochemical Method

Cross sections 4 μm thick obtained from the paraffin blocks of selected patients were transferred to positively charged slides for immunohistochemical examination using a CD117/c-kit (catalogue no. CME 296 AK Biocare Medical USA) and Elastin (catalogue no. GTX29519 Genetex, Inc.UA) antibodies). Sections were deparaffinized. Dehydration was performed in 96-degree ethyl alcohol and antigen recovery was carried out in a microwave oven in pH 6.0 citrate buffer solution. The sections were cooled for 20 min at room temperature and kept in phosphate buffered saline (PBS) solution for 10 min. The tissues were circled using a hydrophobic pen, and then maintained in protein block solution (Ultra V Block) for 5 min. The sections were then washed with PBS and incubated for 40 min using a CD117/c-kit and elastin. Next, they were washed with PBS, maintained at room temperature for 20 min with coenzyme Value Primer Antibody Enhancer, and then washed with PBS solution. Afterwards, they were treated with Value HR Polymer for 30 min in a dark environment. They were then washed with PBS, maintained in AEC (3-amino-9-ethylcarbazol) single solution, and then washed with distilled water. Contrast staining was performed for 2 min using Mayer’s hematoxylin. After drying at room temperature they were covered with aqueous mounting material (Ultramount, Labvision), and then evaluated under a light microscope.

Evaluation of CD117, Elastin, Masson’s Trichrome, and Reticulin Staining

Cajal cells between the muscle layers stained with CD117 were enumerated in the 10 Times Enlarging Area (TEA) and evaluated as follows: n=0-1 (-); n=2-5 (+); n=6-10 (++); n=≥11 (+++). Macrophages in the mucosa and submucosa were evaluated as positive controls. Evaluation of elastin staining was positive (+) or negative (-). The blood vessel wall was evaluated as a positive control. Masson’s trichrome staining evaluation was performed according to fibrosis in the submucosa. Elastin couldn’t be separated, as the collagen, elastin, and other connective tissues were stained blue; staining was considered positive (+) if there was blue coloring under the epithelium and negative (-) if there wasn’t. Reticulin was evaluated according to the thickness of the fibers in the submucosa, as positive (+) or negative (-); reticulin fibers observed via low magnification were considered positive (+) and those that were not were considered negative (-).

Statistical Analysis

Statistical analysis of the data was performed using SPSS v.15.0 for Windows (SPSS Inc., Chicago, IL, USA). Frequencies and means for all data in both groups were calculated. Between-group comparisons were made using the Chi-square test with Yates correction. The level of statistical significance was set at p<0.05.

Results

The mean age of group 1 patients was 8.12±2.6 years (1-12 years) and of group 2 patients, 38.16±5.91 years (16-62 years). No statistically significant difference was determined between the groups in respect of collagen type 3, elastin, fibrosis or cajal cells (p>0.05) (Table 1, Figure 1). The mean follow-up period was 18 months (9-24 months).

Discussion

The cause of congenital ureteropelvic junction obstruction is not fully known. Several studies have suggested that congenital obstruction in the ureteropelvic junction originates from changes in the structure of collagen and smooth muscle cells (7).

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P= Chi-square test
In conclusion, the results of this study have shown that the histopathological impairment in the uteropelvic junction formed from congenital UPJO, has not developed secondary to the obstruction and there is no change in the histopathological structure over time. In the current study, the number of cases was low and there was no control group for evaluation of normal UPJ segments. Therefore, there is a need for further studies on this subject with a greater number of cases and including a control group.

Conflicts of Interest
There are no conflicts of interest.

References