

Karakteristik Tunika Dartos Sisi Ventral Berdasarkan Lokasinya terhadap Meatus Uretra pada Pasien Hipospadia dengan Chordee: Kajian terhadap Gambaran Histopatologi serta Ekspresi COL1A1, COL3A1, dan ELN = Ventral Dartos Tunica Characteristics Based on Its Location Relative to the Urethral Meatus in Hypospadias Patients with Chordee: A Study of Histopathological Features and the Expression of COL1A1, COL3A1, and ELN

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Abstrak

Penyebab chordee pada hipospadia masih belum sepenuhnya dipahami. Koreksi bedah melalui reseksi tunika dartos dapat meluruskan penis, sehingga diduga struktur ini berperan dalam kelengkungan superfisial. Penelitian ini bertujuan untuk membandingkan persentase kolagen dan ekspresi gen COL1A1, COL3A1, serta ELN pada tunika dartos bagian proksimal dan distal penis pada pasien hipospadia dibandingkan dengan kontrol yang disetarakan berdasarkan usia. Penelitian kasus kontrol prospektif ini melibatkan 50 pasien hipospadia (25 hipospadia distal dan 25 hipospadia proksimal) dan 50 subjek kontrol dengan usia yang sesuai. Sampel jaringan tunika dartos diambil dari bagian ventral proksimal dan distal penis pada pasien hipospadia, serta dari area koronal pada kelompok kontrol. Persentase kolagen dinilai secara histologis menggunakan pewarnaan Masson's Trichrome, dan ekspresi gen dianalisis melalui real-time polymerase chain reaction (RT-PCR). Analisis subkelompok dilakukan berdasarkan tipe hipospadia dan derajat kelengkungan penis. Terdapat perbedaan bermakna dalam persentase kolagen serta ekspresi COL1A1, COL3A1, dan ELN antara tunika dartos bagian distal, proksimal, dan kontrol ($p < 0,01$). Tunika dartos bagian proksimal menunjukkan penurunan paling konsisten pada semua penanda ($p < 0,01$). Pada hipospadia distal dan chordee ringan, tunika dartos bagian distal menunjukkan nilai serupa dengan kontrol ($p > 0,05$), sementara tunika dartos bagian proksimal mengalami penurunan bermakna ($p < 0,001$). Pada hipospadia proksimal dan chordee berat, kedua lokasi tunika dartos menunjukkan penurunan, dengan tunika dartos bagian distal memiliki penurunan COL3A1 dan ELN yang lebih nyata ($p < 0,05$). Rasio COL3A1:COL1A1 juga mengalami penurunan bermakna pada pasien hipospadia, terutama pada tunika dartos bagian proksimal dan pada chordee sedang hingga berat. Komposisi matriks ekstraseluler tunika dartos pada pasien hipospadia bervariasi berdasarkan lokasi anatomi dan derajat keparahan. Tunika dartos distal masih dapat dipertahankan untuk penutupan neouretra pada hipospadia distal dengan kelengkungan ringan, sementara eksisi lebih disarankan pada kasus hipospadia proksimal.

.....The cause of penile curvature (PC) in hypospadias remains unclear. Surgical correction through dartos tunica resection can straighten the penis, suggesting its role in superficial PC. This study aimed to compare collagen density and gene expression of COL1A1, COL3A1, and ELN in proximal and distal dartos tunica of hypospadias patients and age-matched controls. In this prospective case-control study, 50 hypospadias patients (25 distal hypospadias and 25 proximal hypospadias) and 50 age-matched controls were included. Dartos tunica samples were collected from proximal and distal ventral penile regions in hypospadias cases, and from the coronal area in controls. Collagen density was assessed histologically using Masson's trichrome staining, and gene expression was quantified using real-time polymerase chain reaction (RT-

PCR). Subgroup analyses were performed based on hypospadias type and PC severity. Significant differences of collagen density, COL1A1, COL3A1, and ELN were observed among distal dartos tunica, proximal dartos tunica, and controls ($p < 0.01$). The proximal dartos tunica exhibited the most consistent reduction across all markers ($p < 0.01$). In distal hypospadias and mild PC, the distal dartos tunica remained comparable to controls ($p > 0.05$), while the proximal dartos tunica showed significantly reduced values ($p < 0.001$). In proximal hypospadias and severe PC, both dartos tunica regions were affected, with the distal dartos tunica showing more pronounced reductions in COL3A1 and ELN ($p < 0.05$). The COL3A1:COL1A1 ratio was also significantly reduced in hypospadias patients, particularly in the proximal dartos tunica and in those with moderate to severe penile curvature. The extracellular matrix composition of dartos tunica in hypospadias varies according to anatomical location and severity. The distal dartos tunica may be preserved for neourethral coverage in distal hypospadias and mild PC, while excision may be more appropriate in proximal hypospadias.