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Abstract 115

Efficacy of endoscopic urethral stricture treatment using lighted catheter: A pilot trial

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Introduction: Red and near-infrared light (NIR) were shown to provide positive photobiomodulation (PBMT) in multiple injury models. Such biostimulatory effects were utilized to promote wound healing by dampening inflammation, which plays a vital role in the early phase of tissue repair. We aimed to investigate light therapy in urethral stricture repair. Our hypothesis was that those rabbits treated with direct vision internal urethrotomy (DVIU) followed by light therapy have higher rates of stricture resolution on imaging and decreased inflammation on histologic specimen.

Methods: A previously developed rabbit stricture model was used. After successful stricture induction, the subjects were randomized into three groups: control, red light, and NIR group. All subjects underwent DVIU followed by catheter insertion. The control group received catheters without any modification. The red light group received an engineered catheter with red light source inside the catheter. The NIR light group received an engineered catheter with NIR light source. Each day for seven days, 5.4J/cm^2 of energy was delivered to the treatment arms. Catheters were then removed. The animals were sacrificed at 24 weeks after retrograde urethrograms (RUG) and urethroscopy by a surgeon blinded to the treatment arm. Radiographic images and histological specimens were reviewed by a radiologist and a pathologist, respectively, blinded to the treatment arm. Detectable radiographic improvement was defined as at least 10% of improvement in the percentage of stenosed lumen after treatment. Histological specimens were assessed for inflammation.

Results: Stricture was successfully induced on 24 rabbits, which were then randomized, eight per arm. The control group had a mean of 41% stenosis, while the red light group had a mean of 47% and the NIR group, of 37%. Seven of the eight rabbits in the red light group (87.5%) and eight of eight (100%) in the NIR group had detectable improvement. In contrast, six of eight subjects (75%) in the control group had detectable improvement. In the control group, two (25%) had worsening strictures, and one had a complete obliteration. No worsening stricture was found in either treatment arm. Four of eight (50%) in the control group had >50% improvement, compared to two of eight (25%) and five of eight (62.5%) in the NIR and red light groups, respectively. Chronic inflammation was significantly more pronounced in the control group, when compared to the NIR group (p=0.04).

Conclusions: This pilot study successfully demonstrated feasibility of utilizing red or NIR light energy via engineered catheters. Such a method may allow for a wide application of this novel concept to use light therapy to augment DVIU.

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Abstract 116

A novel model of urethral stricture in rabbits

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Introduction: Urethral stricture models have been established in rabbits for many years. Our previous experiments utilized New Zealand white rabbits and induced strictures by endoscopic electroresection. Despite technical feasibility, rate of successful stricture formation on first induction, defined by >30% stenosis in urethral lumen, was not optimal, ranging from 18% to 27%. Most rabbits required re-induction once or twice. Not only does it add trauma and stress for the animals, it also increases time, cost, and more importantly, bias, to the research. Prior studies in humans have demonstrated that hypogonadism correlates with worse urethral stricture disease. Our aim was to evaluate the effect of castration on stricture induction, with the goal of creating a more efficient stricture induction model.

Methods: Ten male New Zealand white rabbits were included in this study, randomized into a control and a treatment group. Rabbits in the treatment group underwent bilateral orchiectomy for castration. Two months later, all rabbits underwent electroresection to induce strictures. A 1 cm long longitudinal incision was made in the urethral mucosa using a 10 Fr pediatric resectoscope. The incision extended from the three to nine o'clock position. The defect was created in an area of bulbar urethra approximately 1 cm distal to the external sphincter and 2 cm proximal to the meatus. Six weeks after induction, a retrograde urethrogram (RUG) was performed under fluoroscopic guidance to evaluate for degree of stenosis. Cystoscopy was performed to evaluate cystoscopic evidence of stricture. Our end points were radiographic and histological evidence of successful stricture induction.

Results: In the experimental group, 5/5 (100%) developed stricture, with an average of 55% of stenosis of the urethral lumen. In the control group, only 2/5 (40%) developed stricture, averaging 27% stenosis (p=0.005). More severe strictures were observed in the castrated group, where 3/5 (60%) developed stricture >50%. In comparison, no animals in the control group developed stricture >50% stenosis.

Conclusions: Castrating the rabbits prior to electroresection significantly improves stricture induction rate. Further histological study needs to be performed to investigate histological changes.

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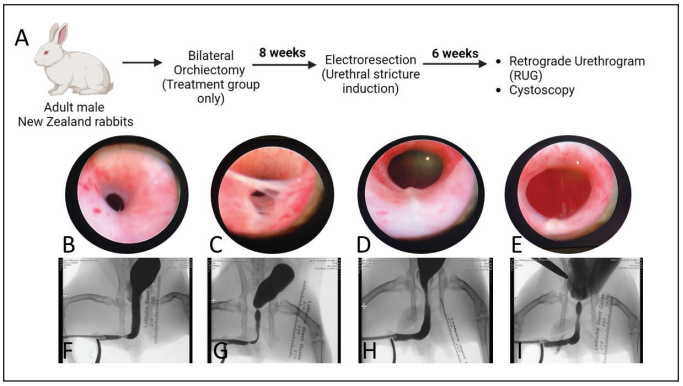

Abstract 116. Figure 1. Overall experimental design; cystoscopic views of strictures. (A) Overall experimental design; (B & C) Cystoscopic view of severe strictures in castrated rabbits; Figures (D & E) Cystoscopic view of less severe strictures in control rabbits; (F & G) Corresponding RUG showing severe strictures; (H & I) Corresponding RUG showing less severe strictures.