ORIGINAL ARTICLE

Esophageal dilation through bouginage or balloon catheters in children, as the treatment of benign esophageal strictures: results, considering the etiology, and the methods

Ender Fakıoglu, M.D.,[1] Lütfi Hakan Güney, M.D.,[1] İbrahim Ötgün, M.D.,[2]

[1]Department of Pediatric Surgery, Başkent University, Ankara-*Türkiye*
[2]Department of Pediatric Surgery, Memorial Hospital, Ankara-*Türkiye*

ABSTRACT

BACKGROUND: Corrosive substance ingestion, history of esophageal surgery, and reflux esophagitis are the main causes of benign esophageal strictures in children. Esophageal dilation is the first treatment option. Bougies and balloons are the most frequently used dilation tools. The literature record on esophageal dilation methods and their results is mostly composed of data gathered from adults, who differ from children in many terms, including etiology, indications, and results. This study aims to evaluate esophagial dilation in children; comparing the two mentioned modalities; and considering the impact of different diseases on dilation success.

METHODS: The benign esophageal stricture cases who had undergone esophageal dilation between 2001 and 2009, at two tertiary health-care centers of a university were evaluated retrospectively with regard to stricture etiology, treatment methods, and their results. In addition, balloon and bougie dilations were compared.

RESULTS: Fifty-four cases were dilated in 447 sessions. The strictures were due to corrosive ingestion or anastomoses in 72.2% of the cases. Of the dilation sessions, 52.6% were performed with Savary-Gilliard bougies, and the rest with balloon dilators. No guidewire was needed in 53.2% of the bougie sessions. Fluoroscopy was used during balloon dilation sessions as a routine part of the method, while it was needed only to check the guide location when needed during the bougie dilation sessions. The complication rates of balloon and bougie dilation sessions were 2.4% and 2.1%, respectively. The mean session length was 26.2±11.8 and 42.6±13.7 min, for bougie and balloon, respectively. Success rate was 93.7% for the balloon, while 98.2% of the bougie sessions. Balloon catheters used were disposable.

CONCLUSION: Savary-Gilliard bougies have advantages over balloon catheters with less need of fluoroscopy, shorter duration of sessions, and lower cost. Both methods are equivalently safe with close complication rates.

Keywords: Balloon dilation; benign esophageal stricture; bougie dilatation; esophageal dilation in children; pediatric; savary-gilliard.

INTRODUCTION

Vast majority of the esophageal stricture cases in children have benign etiologies: corrosive substance ingestion (CSI), history of esophageal surgery (the leading two causes), gastroesophageal reflux esophagitis, achalasia, epidermolysis bullosa, radiotherapy, fungal infections, and eosinophilic esophagitis.[1] Malignancy-related esophageal stricture is extremely rare in pediatric age group.[1-5]

Esophageal dilation is the first treatment option for benign strictures.[1] Bougies and balloon catheters are the most frequently used dilation tools.[1] Although remarked as safe and

Cite this article as: Fakıoglu E, Güney LH, Ötgün İ. Esophageal dilation through bouginage or balloon catheters in children, as the treatment of benign esophageal strictures: Results, considering the etiology, and the methods Ulus Travma Acil Cerrahi Derg 2023;29:574-581.

Address for correspondence: Ender Fakıoglu, M.D.
Department of Pediatric Surgery, Başkent University, Ankara, Türkiye
E-mail: nderf@gmail.com

Ulus Travma Acil Cerrahi Derg 2023;29(5):574-581 DOI: 10.14744/tjtes.2022.03881 Submitted: 16.08.2022 Revised: 17.11.2022 Accepted: 06.12.2022

efficient, the literature data regarding the dilation methods and their results are mostly from adults.[6-9]

In this study, the records of the benign esophageal stricture cases treated with dilation between 2001 and 2009 at two tertiary health-care centers of a university were evaluated to compare the balloon catheter use with bougienage in terms of safety and efficacy; considering the stricture etiology; and regarding the impact of different diseases on dilation success.

MATERIALS AND METHODS

Following the required approval of the Institutional Ethics Committee (approval number: KA09/283), the medical records of the benign esophageal stricture cases, who had undergone esophageal dilation between 2001 and 2009, by the pediatric surgeons of the two tertiary health-care centers of a university, were reviewed.

At the focused study period, the pediatric surgery teams of the two tertiary centers of the department were composed of pediatric surgeons with similar surgical educational and practical backgrounds, managing the esophageal stricture cases with the same algorithm; but for esophageal dilation, the team at one center preferred to use Savary-Gilliard polyvinyl bougies, while balloon catheters were preferentially used by the team of the other center.

None of the included cases received any adjuvant therapy to reduce fibrosis, as steroids and Mitomycin C.

Patient records were reviewed in terms of age, sex, stricture etiology, stricture type, applied dilation method; needs of guidewire, fluoroscopy, and endoscope; and dilation results, operation duration, and dilation-related complications. Although no classification of the esophageal strictures was made for children in the literature, considering the classification criteria assessed for adults; the concentric strictures shorter than a vertebral height were categorized as "simple," whereas the longer and/or multiple, irregular ones were classified as "complex."[8-10]

"The thumb rule," which approximates a child's esophageal luminal diameter to its thumb diameter, was roughly the determinant of the desired ultimate esophageal diameter with dilation sessions for each esophageal stricture case.[11] The desired esophageal diameter for each dilation session is determined with "the rule of 3" which recommends passing no more than three consecutive dilators in increments of 1 mm over the stricture size, for safety, and efficacy.[10] The operations which resulted in "desired esophageal diameter for the session" were categorized as "successful," and the others were accepted as "unsuccessful."

As there is no consensus on the optimum intervals between dilation sessions in the literature, timing in our algorithm is mainly shaped by the recurrence of the clinical complaint, mainly disphagia; accepting 3–4 weeks of interval as a milestone especially for refractory strictures.[11]

The cases with no need of dilation for at least 1 year were accepted to be "cured". The cases who have continued to be traeated at other institutions were categorized as "unfollowed."

The data were analyzed as two seperate sets using SPSS 15.0®: The set of patient-based parameters and the set of (dilation) procedural parameters. Descriptive and comparative analyses were made. Chi-square test was used, and $P<0.05$ was accepted as statistically significant.

RESULTS

A total of 447 esophageal dilatation sessions were performed on 54 benign esophageal stricture cases, aged 1 to 210 months (median: 24). The numbers of the sessions applied to each patient were in a range of 1 to 41 (median: 5).

The benign esophageal stricture etiologies detected are listed in Table 1. CSI was the most frequent (37%) etiological factor, followed by anastomotic strictures (AS) (%35.2).

Fifteen of the 19 AS cases had a history of esophageal atresia repair (EAR), and the remaining four had strictures secondary to colonic interposition.

The esophageal strictures were simple in 72.9% of the cases, while the remaining 27.1% had complex esophageal strictures. All of the dilation sessions were performed under general anesthesia, in operating room settings.

The end results of the overall esophageal dilation sessions of the patients during the study period are summarized in Table 2.

When the cases of ongoing dilation (n=5) and the ones fallen out of follow-up (n=3) are excluded, the cure rate of esopha-

Table 1. Benign esophagus stricture etiologies

	n	%
Corrosive substance ingestion	20	37.0
Anastomotic stricture	19	35.2
Post-fundoplication	6	11.1
Gastroesophageal reflux esophagitis	5	9.2
Congenital	2	3.7
Aspergillus esophagitis	1	1.9
Epidermolysis bullosa	1	1.9
Total	54	100.0

Table 2. End results of esophageal dilations for benign esophageal strictures

End result	n	%
Complete cure	43	79.6
Ongoing dilations	5	9.2
Out of follow-up	3	5.6
Colonic interposition	2	3.7
Fundoplication revision	1	1.9
Total	54	100.0

Table 3. Esophageal stricture types, according to the ingested corrosive substance pH

	Annular stricture	Complex stricture	Total
Acidic CSI	6	1	7
Alkaline CSI	5	8	13
Total	11	9	20

geal dilation among the patients whose dilation sessions ended was 93.5%.

CSI cases, aged eight to 144 months, underwent a total of 278 dilation sessions (median: 11).

The corrosive substances ingested were alkaline (NaOH) in 13 cases (65%); in forms of degreasing agent in 11 cases, drain opener in one case and caustic solution for soap production in one case.

The ingested acidic substances by the remaining cases were nitric acid-used as anti scale, acetic acid-used as spirit of vinegar, and hydrochloric acid-used as descaling agent for air-conditioners.

Esophageal strictures were complex in 45% of CSI cases. Among the alkali CSI cases, the incidence of complex esophageal stricture is 61.5%, while it is 14.3% among the acidic CSI cases. Of the CSI-caused complex esophageal stricture cases, 88.9% ingested alkaline substances (Table 3).

Table 4. End results of the esophageal dilations for corrosive esophageal strictures

	n	%
Cure	15	75.0
Ongoing dilations	2	10.0
Colonic substitution	2	10.0
Out of follow-up	1	5.0
Total	20	100.0

End results of the dilation sessions of the corrosive esophageal strictures are summarized in Table 4. Both of the two patients who underwent colonic substitution (CoS) after failed esophageal dilation attempts were alkaline CSI cases.

The 19 AS case underwent 94 dilation sessions (median: 3). AS was secondary to EAR in 15 cases, whereas the proximal coloesophageal AS following CoS was the case in four.

Fifty-six dilation sessions (median: 3) were applied to the 15 post-EAR stricture cases, aged two to 27 months (median: 9, mode: 4), whereas 38 sessions (median: 10) were applied to to the four post-CoS stricture cases aged 22–210 months.
All of the post-EAR stricture cases were completely cured by the esophageal dilation sessions. Only one of the four post-CoS stricture cases was recorded to be cured.

Post-fundoplication distal esophageal obstruction needed esophageal dilation in six cases, aged between 11 and 158 months (median: 30). Those cases underwent 11 esophageal dilation sessions (median: 1) and a cure rate of 83.3% yielded. Only one of them could not be cured and fundoplication revision was needed.

Four cases of peptic esophageal strictures, caused by gastroesophageal reflux (GER), underwent total 27 dilation sessions. Two of them had simple strictures, while the other two had complex strictures. On esophageal dilatation sessions with medical treatment and life style modifications for GER, anti-reflux surgery was performed to those patients.

Two cases, aged 13 and 15 months, had congenital esophageal strictures. Complete recovery was the result of four dilation sessions in one case, and seven dilation sessions in the other.
A 3-year-old girl with epidermolysis bullosa, complaining of solid dysphagia, was diagnosed to have an simple stricture at proximal esophagus, which was cured after three sessions of dilation.

A 16-year-old male on chemotherapy for acute lymphoblastic leukemia was diagnosed to have complex distal esophageal stricture, caused by aspergillus esophagitis. It was cured after nine sessions of esophageal dilation.

Of the total 447 dilation sessions, 52.6% were performed with Savary-Gilliard bougies, while the remaining 47.4% were performed with balloon dilators.

Eleven of the bougie-dilation sessions were planned and initiated as balloon dilation. Switching to bougies was needed due to balloon dysfunction (burst) or failure of insertion of the balloon catheters through the strictures. In other words, 4.9% of the intended balloon dilations sessions were failed to be performed.
A guidewire was used in 319 (71.4%) of the dilation sessions. In 17 (5.3%) of those, the guidewire failed to be inserted di-

Table 5. Guidewire need in balloon- and bougie-dilation sessions (P<0.001)

	Guidewire (+)	Guidewire (-)	Total
Bougie	110	125	235
Balloon	206	6	212
Total	316	131	447

Table 6. Complication rates of the dilation sessions according to the methods (P>0.05)

Method	Complication (-)	Complication (+)	Total
Bougie	206	29	235
Balloon	196	16	212
Total	402	45	447

rectly (with or without esophagoscopy) through the stricture. In these sessions, the guidewire was inserted through the Savary-Gilliard bougie of the smallest diameter, after the thin tip of the bougie was inserted through the stricture.

No guidewire was used in 53.2% of the bougie-dilation sessions, while this rate was only 2.8% in balloon-dilation sessions (P<0.001) (Table 5).

Fluoroscopy is a routine part of the procedure in balloon dilation sessions. It was used only in 14% of the bougie-dilation sessions, shortly, just to check the location of the tip of the guidewire (if it is in the stomach or not).

The overall complication rate of the dilation sessions was 10%. The recorded complications were self-limiting minor hemorrhage, major hemorrhage requiring hospitalized follow-up and intervention (transfusion and local adrenaline injection), esophageal perforation (Table 6).

Table 7 summarizes the major complications (major hemorrhage and esophageal perforation), requiring shifts in treatment strategies; the rates were 2.4% for balloon and 2.1% for bougie. The esophageal perforation rates were 0.4% for bougie and 0.9% for balloon dilation sessions.

The complication rates of the balloon- and bougie-dilation methods did not yield statistical significance.

Dilation sessions lasted 10–90 min (mean: 34.6±15.2 min). The 235 sessions of original intention to be performed through bougies lasted 10–65 min (mean 26.2±11.8). Of those, 77.8% lasted <30 min, 97.2% lasted <45 min.

The 212 balloon-dilation sessions lasted 15–90 min (mean 42.6 ± 13.7). Of those, 59% lasted at least 45 min (Table 8).

Table 7. Major complication rates of ballon- and bougie-dilation sessions (P>0.05)

	Major complication (+)	Major complication (-)	Total
Bougie	5	230	235
Balloon	5	207	212
Total	10	437	447

Table 8. Operative times, excluding converted sessions from balloon to bougie (P<0.001)

	≥45 min	<45 min	Total
Bougie	27	197	224
Balloon	125	87	212
Total	152	284	436

Table 9. Success rates, when the converted sessions are considered as failed balloon-dilation sessions (P<0.05)

	Success	Failure	Total
Balloon	209	14	223
Bougie	220	4	224
Total	429	18	447

The 11 dilation sessions, converted from balloon to bougie due to failed balloon-dilatation, lasted 30–60 min (median: 45, mode: 45).

Considering the operative times, excluding the 11 converted ones, when the sessions were grouped as "≥45 min" and "<45 min" balloon-dilation sessions lasted significantly longer (P<0.001) (Table 8).

The success rate of the dilation sessions was 98.4%. The failed seven sessions were terminated on suspicion of esophageal perforation in two cases, and failure to insert the dilators through the stricture in five cases.

When the balloon-to-bougie converted group is added to the failed balloon-dilatation group, the success rate was 93.7% for balloon, 98.2% for bougie dilations (P<0.05) (Table 9).

DISCUSSION

Esophageal strictures in childhood differ from the adult cases in many aspects including etiology, clinical presentation, and treatment. The literature data on this problem and its treatment in children are limited. To their literature review of the 29-year period between 1989 and 2018, Ghiselli et al. could include only 17 studies on solely pediatric esophageal strictures.[1]

The most frequent cause of esophageal stricture in childhood is CSI, which is also the case in this study.[1,12,13]

In the literature, CSI is more frequent among the children younger than 6 years, most of whom are 12–48 months of age.[14,15] Our study population is consistent with it, too.

Higher incidence of complex esophageal strictures following alkaline CSI (88.9% of all complex strictures), compared to acidic CSI is due to more destructive nature of the alkaline corrosive substances. That is because the alkaline substances cause liquefaction necrosis, which continuously deepen until neutralization. On the other hand, acidic corrosives generally cause self-limiting coagulation necrosis and their bitter taste and oral burning sensation they cause, make them less likely to be swallowed, compared to tasteless alkaline substances. In addition, less viscous nature of acidic corrosive substances makes their transit time through the esophagus (and their contact duration) shorter than that of more viscous alkaline corrosives.[13,16-19]

As our study results confirm, AS secondary to EAR are treated with 100% success rate of dilation regimes, needing fewer dilation sessions than the CMI cases need. AS are unlikely to be complex.[1,10,20,21]

Fundoplication for GER may cause transient post-operative dysphagia. That may be caused by tight fundoplication, post-operative edema, and distal esophageal denervation secondary to mobilization. Although previously reported to resolve in 6 months; in a study on 345 cases of Nissen fundoplication, Negre suggested that the dysphagia does not completely resolve, but the severity regresses.[22] In the present study, the chief complaint was dysphagia in all of the cases of post-fundoplication esophageal dilation. Single dilation session was enough to treat 66.7% of them, while the remaining needed just two sessions; maximum 58 days later than the fundoplications. All post-fundoplication stricture cases were treated successfully, free of any complication. Esophageal dilation is remarkably safe and effective in treatment of post-fundoplication esophageal stricture cases.

For esophageal dilation, the guidewire may be inserted through the stricture directly or under fluoroscopic and/or endoscopic vision.[12] In the complicated cases with hard stricures, retrograde distal esophageal intubation through gastrostomy and retrograde insertion of the guidewire to the mouth through that distal esophageal tube is another option for selected cases, as Tanyel et al. reported.[23]

In our study, in 5.3% of the sessions in which a guidewire was intended to be used, the guidewire could not be inserted distally through the stricture due to retrograde coiling just proximal to the stricture. A Savary bougie of thin caliber (14–17 F) was the solution in those sessions. The tapered semi-rigid tip of the Savary bougie was more resistant to coiling as a result of its polyvinyl material and shape: hard enough not to curl back, and thin enough to pass distally through the stricture. As a result it has been easier to insert at least its thin tip through the stricture, which leads the guidewire the way to stomach through it. To date, in the English literature, there is not any specific report regarding this potential function of thin-caliber Savary bougies, helping orogastric guidewire insertion through challenging esophageal strictures of eccentric and irregular natures.

Methodologically, a guidewire is necessary for esophageal balloon-dilation especially when endoscopic vision is not used. In our study, 51.5% of the bougie-dilation sessions were performed successfully without guidewire. Of the 127 "no-guidewire" bougie-dilation sessions, no complication was encountered, except one case of hemorrhage. Although guidewire and fluoroscopy were reported to lower the complication rates,[8,12,24] they may not be necessarily needed in selected cases. Enough familiarity to individual stricture anatomy, the delicate force applied to the bougies with delicate maneuvers and enough lubrication of the bougies are the critical points to be considered. Although the cases with simple strictures and/or the cases with which the surgeon is familiar from the previous dilation sessions seem suitable for that option; randomized, controlled, and prospective studies are needed to assess it more objectively.

Intraoperative fluoroscopy use creates a remarkable X-ray exposure both to the patients and the operating teams. Just a plain thorax radiogram exposes the patient to a radiation of 25 millirems. An ordinary "C"-armed fluoroscopy device exposes approximately 1200–1400 millirems of radiation per minute. It is recommended not to expose the thorax to more than 5000 millirems of radiation per year.[25]

Balloon-dilation sessions require guidewires, significantly more than the bougie-dilatation sessions do. They also naturally require fluoroscopic vision to check the position of the balloon, situation of the stricture when the balloon is inflated, to see whether the balloon has deflated at the end of the session to be pulled out safely. The use of a guidewire creates another subject of fluoroscopy need, to check its position, regardless of the dilation method. No need of guidewire in more than half of the bougie-dilation sessions limits radiation exposure.

Kabbaj et al. reported in their study on adults, dilation with Savary-Gilliard dilators without fluoroscopy to be safe and effective to treat very tight esophageal strictures if performed with care.[7] Although they inserted the guide and the dilators under endoscopic vision, our results support the possible safety of blind insertion of guidewire and/or the Savary-Gilliard dilators in selected patients; especially the chronic cases the stricture anatomy of whom are well-known by the surgeon. The guideline by the American Society for GI Endoscopy on Esophageal dilation reports that the Maloney type bou-

gies with tapered tips can be passed blindly.[8] We believe that this is possible in selected cases, with Savary-Gilliard bougies which also have tapered and semi-rigid tips, provided that the surgeon has enough experience.

Manfredi defines "mechanical (bougie) dilation" as "a tactile technique." He emphasizes that, as the bougie is advanced across the stricture site, it should be possible for the proceduralist to be able to feel a degree of resistance. Hence, he remarks the object to be feeling and overcoming the resistance of the stricture.[10]

In multiple and/or long-segment esophageal strictures, balloon-dilation requires a methodological sequence repeat (including fluoroscopic check, inflation, and deflation) at each stricture level, which multiplies both the radiation exposure and the operation duration. On the other hand, insertion of the bougies just once, through the strictures, would suffice to get the desired result, which makes bougie-dilation advantageous at that point.

Even though the sole radial force created by the inflated balloon at the stricture level has been reported to make balloon dilatation safer than bougie-dilatation, our study revealed no significant difference between the complication rates of the methods.[12,24]

Our study contrasts to the reports of the "unsafer" image of bougie-dilation than balloon-dilation. Compared with the rigid or semi-rigid bougies, the balloon catheters themselves are delicate tools. In the light of our results, we think that the delicacy of the surgeon's technique is the determining factor with bougie-dilation. Defining every individual stricture anatomy, feeling and staying aware of the stricture resistance, controlled and gentle force exertion with no hesitation of using fluoroscopic and/or endoscopic guidance when needed, are the key points.

The routine guidewire need, multiple procedural repeats for multiple, or long segment strictures are the factors contributing to the significantly longer operative times of balloon-dilation than those of bougie-dilation. However, other uncontrollable factors such as anesthesia-related issues which may lenghten the recorded operative time, differences between the operating teams are not possible to be evaluated with the present data set. Controlled and randomized prospective studies comparing operative times of esophageal dilation methods, ragarding those potential effector variables, would supply more reliable data.

On dilation sessions, when we define the diminition of the patient's complaint with resolution of the radiological stricture finding on completion of the session technically as "success," and the unability of the sesssions of intended technique to be completed with the desired dilation caliber as "failure;" bougie-dilation was significantly more successful than the balloon sessions ($P<0.05$). Dall'Oglio et al., too, remarks Savary dilators to be safer and more effective than balloon dilators, in the treatment of consolidated and old cicatrical strictures.[11]

Many studies in the literature report equivalence of safety and efficacy of the balloon and bougie dilators.[1,10,26]

Shemesh and Czerniak, with their study on adult patients, reported the balloon and bougie techniques to be equivalent to each other in terms of complication rates and safety, remarking bougies to be slightly more effective and handy than balloons.[27]

The disposable nature of the balloon-catheters is a disadvantage, compared to resterilizable nature of the Savary bougies, which could be used effectively for years. Regarding that, bougie dilation sessions cost less.

Conclusion

Esophageal dilatation is the treatment method of choice, regarding to its safety and efficacy, in children with benign esophageal strictures.

Savary-Gilliard polyvinyl bougies and the balloon catheters, as the most frequently used esophageal dilatation tools, are equivalent in terms of safety and complication rates.

Considering shorter operative times, less need of fluoroscopy, and cost-effectiveness, Savary-Gilliard bougies are more advantageous than the balloon catheters.

This study is limited by its retrospective nature. Randomized and controlled prospective studies focusing on distinct parameters in wider sample sizes would be beneficial to further verify the results.

Acknowledgment
This study was designed and carried out under supervision of late Prof. Akgün Hiçsönmez; a pioneer of pediatric surgery and founder of Turkish Pediatric Surgical Society. Having had the honour of studying and working beneath his wings, we are grateful for his contributions.

Ethics Committee Approval: This study was approved by the Başkent University Clinical Research Ethics Committee (Date: 30.06.2009, Decision No: KA09/283

Peer-review: Externally peer-reviewed.

Authorship Contributions: Concept: E.F., İ.Ö.; Design: E.F., İ.Ö.; Supervision: E.F., İ.Ö.; Resource: E.F.; Materials: E.F.; Data: E.F., L.H.G.; Literature search: E.F., İ.Ö.; Writing: E.F., L.H.G.; Critical revision: E.F., L.H.G.

Conflict of Interest: None declared.

Financial Disclosure: The authors declared that this study has received no financial support.

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ORİJİNAL ÇALIŞMA - *ÖZ*

Çocuklarda benign özofagus darlıklarının tedavisinde bujinaj veya balonla özofagus dilatasyonu: Etiyoloji ve yöntemlere göre sonuçlar

Dr. Ender Fakıoglu[1], Dr. Lütfi Hakan Güney,[1] Dr. İbrahim Ötgün[2]

[1]Başkent Üniversitesi Tıp Fakültesi, Çocuk Cerrahisi Anabilim Dalı, Ankara

[2]Memorial Hastanesi, Çocuk Cerrahisi Kliniği, Ankara

AMAÇ: Korozif madde yutma, özofagus cerrahisi, reflü özofajiti çocuklarda benign özofagus darlığının başlıca sebepleridir. Özofagus dilatasyonu ilk tedavi seçeneğidir. Bujiler ve balonlu kateterler en sık kullanılan dilatasyon araçlarıdır. Özofagus dilatasyonunun etkin ve güvenli olduğu belirtilmesine rağmen, özofagus dilatasyonu yöntemlerine ve sonuçlarına dair literatür bilgisi daha çok erişkin yaş grubuna ilişkindir. Bu çalışmada, buji ve balon dilatasyon yöntemlerinin karşılaştırılması; benign özofagus darlığı sebeplerinin, dilatasyon sonuçlarıyla ilişkisinin değerlendirilmesi amaçlanmıştır.

GEREÇ VE YÖNTEM: Bir üniversitenin iki adet 3. derece sağlık merkezinde, 2001-2009 arasında, Çocuk Cerrahisi Anabilim Dalı'nca özofagus dilatasyonu uygulanmış benign özofagus darlığı olguları, retrospektif olarak; özofagus darlığı sebepleri, tedavileri ve sonuçları, balon ve buji dilatasyonlarının karşılaştırması temelinde değerlendirilmiştir.

BULGULAR: Elli dört benign özofagus darlığı olgusuna 447 dilatasyon seansı uygulanmıştır. Darlıklar, olguların %72.2'sinde korozif madde yutma ve anastomoz nedenlidir. Dilatasyonların %52.6'sı Savary-Gilliard bujilerle, geri kalanı balonla gerçekleştirilmiştir. Bujiyle yapılmış dilatasyon seanslarının %53.2'sinde kılavuz tele ihtiyaç olmamıştır. Balonla dilatasyonlarda, işlemin olağan bir parçası olarak fluoroskopiden yararlanılmış, bujiyle dilatasyonlarda sadece ihtiyaç halinde, kılavuz telin yerini kontrol etme amaçlı fluoroskopi kullanılmıştır. Balon ve buji dilatasyonlarında komplikasyon oranları sırasıyla %2.4 ve %2.1'dir. Bujiyle ve balonla yapılmış seanslar, sırasıyla ortalama 26.2±11.8 dakika ve 42.6±13.7 dakika sürmüştür. Seansların başarı oranları balonla %93.7; bujiyle %98.2'dir. Balonlar tek kullanım için üretilmiştir.

TARTIŞMA: Dilatasyon aracı olarak Savary-Gilliard bujiler, balonlara göre daha az fluoroskopi ihtiyacı, daha kısa işlem süresi, daha düşük maliyetle daha avantajlıdır. Her iki yöntem, komplikasyon oranları açısından birbirine denktir.

Anahtar sözcükler: Benign özofagus darlığı; çocuklarda özofagus dilatasyonu; balon dilatasyonu; buji dilatasyonu; Savary-Gilliard; pediatrik.

Ulus Travma Acil Cerrahi Derg 2023;29(5):574-581 doi: 10.14744/tjtes.2022.03881