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Real-World Outcomes of Topical Corticosteroids for Pediatric Phimosis: The Impact of Lichen Sclerosus and Second-Line Clobetasol

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**Running Title**

Topical Corticosteroids for Pediatric Phimosis

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**Conflict of Interest**

The authors declare that they have no conflicts of interest related to this study.

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**Ethics Approval**

The study protocol was approved by the institutional ethics committee and conducted in accordance with the Declaration of Helsinki.

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# Real-World Outcomes of Topical Corticosteroids for Pediatric Phimosis: The Impact of Lichen Sclerosus and Second-Line Clobetasol


## Abstract

### Objective

Topical corticosteroids are widely used as first-line therapy for pediatric phimosis, with high success rates reported in controlled studies. However, outcomes in routine clinical practice may be more variable. We evaluated real-world outcomes of topical corticosteroid therapy for pediatric phimosis and explored factors associated with treatment response, including treatment strategy, age, and clinical findings suggestive of lichen sclerosus (LS).

### Materials and Methods

A prospective observational cohort study was conducted including pediatric patients treated for pathologic phimosis between 2018 and 2023. Patients received a 30-day course of topical corticosteroid therapy with betamethasone as first-line treatment (G1), clobetasol as first-line treatment (G2), or clobetasol as second-line treatment after failure of betamethasone (G3). Treatment response was defined as complete foreskin retractability with adequate hygiene, symptom resolution, and no requirement for surgery after a minimum follow-up of 6 months. Associations between treatment response and treatment strategy, age, and clinical findings compatible with LS were analyzed.

### Results

A total of 214 patients were included (mean age 6.7 years; range 1–17 years). Of these, 156 received betamethasone as first-line therapy (G1), 38 received clobetasol as first-line therapy (G2), and 20 received clobetasol as second-line therapy (G3). Response rates were 33.3% in G1, 36.8% in G2, and 60.0% in G3. **Clinical findings suggestive of LS were present in 18 patients at presentation; none demonstrated definitive treatment response, 16 ultimately required surgery, and 2 remained under follow-up at the time of analysis.** Age was not significantly associated with treatment response. Histopathological findings, available only in surgically treated patients, frequently demonstrated lichenoid changes or definite BXO/LS.

### Conclusion

In this real-world cohort, response rates to topical corticosteroid therapy were lower than those reported in controlled studies. Clinical findings suggestive of LS were strongly associated with poorer outcomes. In selected patients who failed initial betamethasone therapy, escalation to clobetasol may provide additional benefit before surgery, although this finding should be interpreted cautiously given the observational study design.


**Keywords:** Pediatric phimosis; topical corticosteroids; betamethasone; clobetasol; lichen sclerosus; balanitis xerotica obliterans

## Introduction

Phimosis is a common reason for referral to pediatric urology clinics. Although physiologic non-retractability of the foreskin is frequent in early childhood and usually resolves spontaneously,



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pathologic phimosis may present with recurrent balanoposthitis, ballooning during voiding, pain, fissuring, hygiene difficulties, or persistent cicatricial non-retractability requiring treatment.

Topical corticosteroids are widely considered the standard first-line therapy for pathologic phimosis because they are non-invasive, inexpensive, and generally well tolerated. Randomized controlled trials and systematic reviews have reported success rates approaching 80–90% in selected patient populations, supporting conservative management before surgical intervention [1–3]. However, outcomes observed in routine clinical practice may differ substantially from those reported in trial settings.

Several factors may reduce the likelihood of successful conservative treatment, particularly underlying cicatricial disease such as lichen sclerosus (LS), also referred to in advanced genital forms as balanitis xerotica obliterans (BXO). In these patients, chronic inflammation, fibrosis, and progressive scarring may limit response to topical therapy and increase the likelihood of circumcision [4–7].

Despite this recognized association, real-world data regarding treatment strategies for pediatric phimosis, particularly escalation approaches using higher-potency corticosteroids after failure of initial therapy, remain limited. Therefore, the aim of this study was to evaluate real-world outcomes of topical corticosteroid therapy for pediatric phimosis and to explore factors associated with treatment response, including treatment strategy, age, and clinical findings suggestive of lichen sclerosus.

## Materials and Methods

This was a prospective observational cohort study conducted at a tertiary pediatric urology center between January 2018 and December 2023 and reported in accordance with the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) statement [8]. The study protocol was approved by the local ethics committee. Given the observational design and use of anonymized routinely collected clinical data, the requirement for informed consent was waived.

All pediatric patients diagnosed with pathologic phimosis during the study period were eligible for inclusion. Pathologic phimosis was defined as non-retractability associated with at least one of the following clinical features: cicatricial narrowing of the preputial ring, recurrent balanoposthitis, ballooning during voiding, pain, fissuring, hygiene difficulty, or persistent symptomatic non-retractability requiring treatment. Patients with incomplete records or without documented topical therapy were excluded.

### Treatment groups

Patients received a 30-day course of topical corticosteroid therapy according to routine clinical practice. Group 1 (G1) received betamethasone 0.05% as first-line therapy, Group 2 (G2) received clobetasol 0.05% as first-line therapy, and Group 3 (G3) received clobetasol 0.05% as second-line therapy after failure of initial betamethasone treatment. Parents were instructed to apply the medication twice daily to the phimotic ring with gentle progressive foreskin retraction.

The choice of first-line agent and the decision to escalate therapy were based on physician judgment rather than a predefined protocol. Clobetasol was preferentially prescribed in selected severe cases or when lichen sclerosus was clinically suspected.

### Variables and definitions



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Recorded variables included age at treatment, treatment group, treatment response, need for surgery, clinical findings suggestive of lichen sclerosus, and histopathological findings when surgery was performed. Clinical findings suggestive of lichen sclerosus included whitish plaques, atrophic patches, sclerosis, progressive scarring, erythematous lichenoid lesions, or recurrent narrowing despite treatment.

Histopathological findings were categorized as absence of lichenoid or sclerotic changes, presence of lichenoid changes, or balanitis xerotica obliterans (BXO)/definite lichen sclerosus.

**Outcome definition**

Treatment response was defined as complete foreskin retractability, adequate hygiene, absence of symptoms, and no requirement for surgical intervention. All patients had a minimum follow-up of 6 months after completion of topical therapy.

**Statistical analysis**

Categorical variables were summarized as frequencies and percentages. Comparisons between treatment groups were performed using the chi-square test, with Yates' continuity correction when appropriate [9]. Age was analyzed descriptively as a continuous variable and categorically (<5 years vs ≥5 years). The <5-year cutoff was selected a priori because physiologic foreskin non-retractability is more common in younger children and spontaneous improvement is expected during early childhood. Statistical significance was defined as $p < 0.05$.

Given the non-randomized observational design, all comparative analyses were considered exploratory and potentially affected by confounding by indication.

**Results**

**Cohort characteristics**

A total of 214 pediatric patients were included in the study. The mean age at treatment was 6.7 years (range 1–17 years). Of these, 156 patients (72.9%) received betamethasone as first-line therapy (G1), 38 (17.8%) received clobetasol as first-line therapy (G2), and 20 (9.3%) received clobetasol as second-line therapy after failure of betamethasone (G3). Clinical findings suggestive of lichen sclerosus (LS) were present in 18 patients (8.4%) at initial presentation. Patient allocation, treatment response, escalation to second-line therapy, and progression to surgery are summarized in Figure 1.

**Treatment response**

Response rates according to treatment strategy are shown in Table 1. Clinical response was observed in 52 of 156 patients (33.3%) in G1, 14 of 38 (36.8%) in G2, and 12 of 20 (60.0%) in G3. Pairwise comparison demonstrated a significantly higher response rate in G3 compared with G1 ($p = 0.015$). No statistically significant differences were observed between G1 and G2 or between G2 and G3.

Among the 104 patients who failed initial betamethasone therapy, only a selected subgroup without an immediate indication for surgery underwent second-line treatment with clobetasol. The remaining patients proceeded directly to surgical management because of persistent phimosis, progressive scarring, recurrent symptoms, or clinical suspicion of lichen sclerosus.



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No significant local or systemic adverse effects related to topical corticosteroid therapy were documented during follow-up.

**Lichen sclerosus and treatment failure**

**Among the 18 patients with clinical findings suggestive of LS/BXO, none demonstrated definitive treatment response. Sixteen patients failed conservative management and ultimately required surgical intervention, whereas 2 remained under follow-up at the time of analysis. These findings support LS/BXO as a major predictor of treatment failure and progression to surgery.**

**Age**

The association between age group and treatment response is shown in Table 2. Among patients with definitive follow-up outcome, response was observed in 29 of 58 children younger than 5 years (50.0%) and in 49 of 112 aged 5 years or older (43.8%), with no statistically significant difference (p = 0.540).

**Surgery and histopathology**

Histopathological analysis was available only in surgically treated patients. Among available specimens, many demonstrated lichenoid inflammatory changes or definite BXO/LS, whereas a minority showed no specific lichenoid or sclerotic pathology. These findings support the clinical impression that progressive scarring disease was enriched among patients who failed conservative treatment.

**Discussion**

This prospective real-world study found substantially lower success rates for topical corticosteroid treatment of pediatric phimosis than those commonly reported in randomized trials and meta-analyses [1–3]. These findings highlight the difference between outcomes achieved under controlled research conditions and those observed in routine clinical practice.

Several factors may explain this discrepancy. Controlled studies often include selected patient populations, standardized treatment protocols, closer follow-up, adherence monitoring, and exclusion of severe cicatricial disease. In contrast, routine practice includes a broader and more heterogeneous spectrum of patients, including children with variable adherence, delayed referral, recurrent inflammation, and progressive scarring disorders.

A key finding of the present study was the strong association between clinical suspicion of lichen sclerosus and treatment failure. This observation is biologically plausible, as chronic inflammation and fibrosis reduce preputial elasticity and may limit reversibility with medical treatment alone. Previous pediatric series have similarly reported poorer outcomes and higher circumcision rates among patients with LS/BXO [4–7].

We also observed higher response rates in the subgroup receiving second-line clobetasol after failure of betamethasone. However, this finding should be interpreted cautiously. These patients were selected according to clinician judgment and may represent a subgroup with residual steroid responsiveness rather than evidence of superiority of escalation therapy itself. The non-randomized design prevents causal inference regarding comparative effectiveness.



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Similarly, clobetasol used as first-line therapy did not clearly outperform first-line betamethasone. This suggests that corticosteroid potency alone may not be sufficient to overcome established pathological scarring or advanced inflammatory disease.

Histopathological findings in surgically treated patients supported a spectrum ranging from lichenoid inflammation to definite BXO/LS, which is consistent with enrichment of progressive disease among children who failed conservative treatment. Although histology was not systematically available for the entire cohort, these findings strengthen the clinical relevance of suspected LS as a predictor of poor response.

Age alone was not a significant determinant of outcome in this cohort, suggesting that the underlying pathological substrate may be more relevant than chronological age when predicting treatment success.

This study has several limitations. First, it was conducted at a single center, which may limit generalizability. Second, treatment allocation was not randomized and was based on physician judgment, introducing potential confounding by indication. Third, adherence to topical therapy was not formally measured. Fourth, partial response was not prospectively recorded as a separate outcome category. Fifth, histopathological confirmation was available only in surgically treated patients. Finally, the relatively small sample size of the clobetasol subgroups limits the precision of comparative analyses. Future prospective randomized studies are needed to better define the role of higher-potency topical corticosteroids in both primary and refractory pediatric phimosis and to determine whether escalation strategies may improve outcomes in selected patients.

Despite these limitations, the prospective real-world dataset provides clinically relevant information not captured in tightly controlled trials. These findings may help clinicians counsel families regarding expected outcomes, identify children less likely to benefit from conservative therapy, and consider earlier escalation or surgical management in selected cases.

## Conclusion

Topical corticosteroid therapy for pediatric pathologic phimosis demonstrated lower success rates in routine clinical practice than those commonly reported in controlled studies. Clinical findings suggestive of lichen sclerosus were strongly associated with treatment failure and progression to surgical management. In selected patients who fail initial betamethasone therapy, escalation to clobetasol may provide additional benefit before surgery, although this observation should be interpreted cautiously given the non-randomized study design. Early recognition of lichen sclerosus may help optimize treatment strategies and avoid prolonged ineffective conservative management.

## Generative AI Statement

During the preparation of this work, the authors used ChatGPT (OpenAI) for language editing and manuscript preparation support. All outputs were critically reviewed and edited by the authors, who take full responsibility for the final content.

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**Conflict of Interest Statement**

The authors declare no conflicts of interest.

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**Tables**

**Table 1. Response to topical corticosteroid therapy and need for surgery according to treatment group (N = 214)**

| Treatment group | Patients, n (%) | Responders, n (%) | Proceeded to surgery, n (%) |
|---|---|---|---|
| **Betamethasone (G1)** | 156 (72.9) | 52 (33.3) | 104 (66.7) |
| **Clobetasol (G2)** | 38 (17.8) | 14 (36.8) | 24 (63.2) |
| **Betamethasone → Clobetasol (G3)** | 20 (9.3) | 12 (60.0) | 8 (40.0) |

*Statistical analysis: chi-square test with Yates' continuity correction. Pairwise comparison demonstrated a statistically significant difference in response rates between G1 and G3 (p = 0.015).*

**Table 2. Association between age group and treatment response among patients with definitive follow-up outcome (n = 170)**

| *Age group* | *Patients, n* | *Responders, n (%)* | *Non-responders, n (%)* |
|---|---|---|---|
| ***< 5 years*** | ***58*** | *29 (50.0)* | *29 (50.0)* |
| ***≥ 5 years*** | ***112*** | *49 (43.8)* | *63 (56.3)* |

***p = 0.540***

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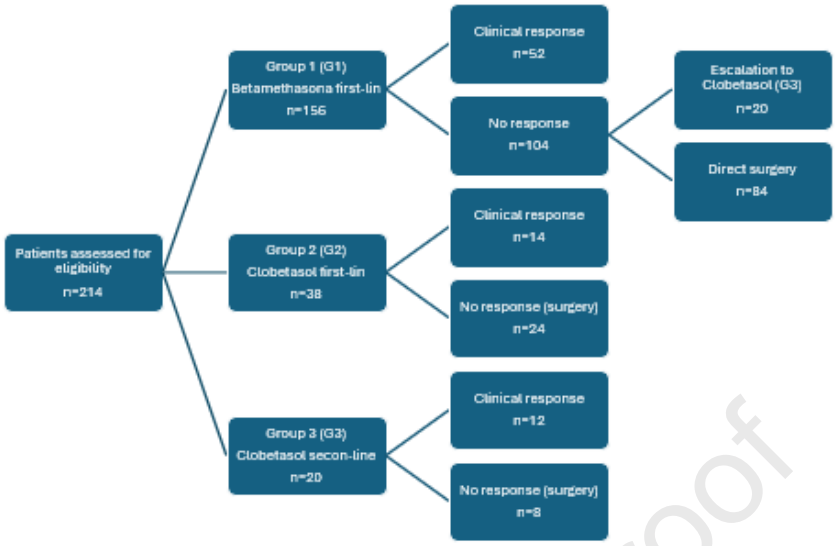


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