

# Selective laser trabeculoplasty - The economics of vision and the paradigm shift in glaucoma: from eye drops to early intervention

Trabeculoplastia seletiva à laser - A economia da visão e a mudança de paradigma no glaucoma: do colírio à intervenção precoce

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## KEYWORDS:

Glaucoma; Selective laser trabeculoplasty; Cost-effectiveness; Unified Health System.

## ABSTRACT

The growing demand for eye care poses significant challenges to the sustainability of public health systems, especially in the management of glaucoma, a chronic, silent disease with a high socioeconomic impact. This article analyzes blindness from a health economics perspective and discusses international and national evidence supporting a shift from a model centered on the continuous use of eye drops to early intervention strategies. Based on clinical studies, cost-effectiveness analyses, and the experience of the Unified Health System, we explore the role of selective laser trabeculoplasty as a clinically effective, economically viable, and socially equitable alternative and indicate pathways for its structured incorporation into the Unified Health System.

## PALAVRAS-CHAVE:

Glaucoma; Trabeculoplastia seletiva a laser; Custo-efetividade; Sistema Único de Saúde.

## RESUMO

A crescente demanda por cuidados oftalmológicos impõe desafios relevantes à sustentabilidade dos sistemas públicos de saúde, especialmente no manejo do glaucoma, uma doença crônica, silenciosa e de alto impacto socioeconômico. Este artigo analisa a cegueira sob a perspectiva da economia da saúde, discutindo evidências internacionais e nacionais que sustentam a mudança do modelo centrado no uso contínuo de colírios para estratégias de intervenção precoce. A partir de estudos clínicos, análises de custo-efetividade e da experiência do Sistema Único de Saúde, o texto explora o papel da trabeculoplastia seletiva a laser como alternativa clinicamente eficaz, economicamente viável e socialmente equitativa, apontando caminhos para sua incorporação estruturada no Sistema Único de Saúde.

## INTRODUCTION

### The cost of blindness and the imperative of sustainability

Often, the focus of the ophthalmology community is on debating the technical refinements of phacoemulsification or the futuristic promises of gene therapy. However, it is imperative that we turn our attention to an equally vital but structural issue: health economics and the sustainability of public ophthalmology.

It is no exaggeration to say that eye health today stands at the critical intersection between accelerated technological progress and the challenge of universal access.

We know that vision loss transcends personal tragedy; it represents a massive global economic burden. Productivity losses due to blindness and visual impairment are estimated to amount to US\$ 411 billion per year worldwide<sup>1</sup>. Therefore, discussing cost-effective-

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ness and resource allocation does not mean reducing medicine to cold numbers but rather guaranteeing visual dignity to as many patients as possible within health systems that operate with finite resources.

To understand the scenario of our Unified Health System (SUS), we need to look outward. Brazil is not alone in facing this challenge; global public health systems encounter similar dilemmas that mirror our reality. Comparative analyses of health systems, particularly those of the United Kingdom, Canada, and Australia, show that the pressure for allocative efficiency is a universal constant<sup>2,3</sup>.

### The UK “mirror”: lessons from the LiGHT study and the NHS

The United Kingdom’s National Health Service (NHS) is often used as a reference because of its public and universal nature, which resembles the principles of the SUS. There, ophthalmology has become the busiest outpatient specialty, accounting for almost 10% of the entire patient waiting list<sup>4</sup>. The NHS offers a hard lesson about the bottleneck created by chronic treatment: despite free access, repressed demand has led to very long waiting lists.

More alarming for our reality is the concept of the “hidden waiting list” for follow-up appointments, in which patients with glaucoma—a silent and progressive disease—run the risk of losing their sight while waiting for their prescriptions to be renewed or their therapy to be adjusted<sup>4,5</sup>. The traditional model, which depends on patient adherence to the daily use of eye drops and frequent visits to measure intraocular pressure (IOP), has proved unsustainable in an aging population.

It was in this context of care pressure that the LiGHT (Laser in Glaucoma and Ocular Hypertension Trial) study began. This multicenter, randomized clinical trial not only challenged clinical conventions but also shook the foundations of public resource allocation by comparing primary selective laser trabeculoplasty (SLT) with conventional treatment using eye drops (prostaglandin analogs) in treatment-naïve patients.

The 6-year results of LiGHT have been conclusive and provide technical guidance for health management<sup>6,7</sup>:

- **Superior pressure control:** SLT has been shown to be as effective or more effective than medication, with better long-term visual field preservation and a reduced need for incisional glaucoma surgery (trabeculectomy).

- **Independence from medication:** A significant proportion (74%) of patients initially treated with SLT did not require eye drops to control IOP in the first 3 years, mitigating the serious issues of nonadherence and ocular surface side effects.
- **Cost-effectiveness:** SLT was 97% more likely to be cost-effective for the NHS than eye drops<sup>6</sup>.

Given this evidence, the National Institute for Health and Care Excellence (NICE) updated its guideline (NG81) in 2022, recommending SLT as the first-line treatment for ocular hypertension and open-angle glaucoma<sup>8</sup>.

### The global scenario: clinical consensus and economic proof

The paradigm shift promoted by LiGHT has reverberated worldwide, with its efficacy validated across different clinical settings. This robust evidence has aligned the guidelines of the American Academy of Ophthalmology, the European Glaucoma Society, and, importantly, the Brazilian Glaucoma Society (SBG). The current consensus is clear: SLT should be considered a first-choice strategy rather than a secondary alternative following eye drop failure<sup>9</sup>.

This global validation is supported by a series of cost-effectiveness studies that consistently demonstrate the long-term economic advantage of laser over polypharmacy:

- **United Kingdom (NHS):** The economic analysis of the LiGHT study showed that a laser-first strategy generated an average saving of £451 (pounds sterling) per patient at 36 months, reducing costs associated with salvage incisional surgeries and multiple follow-up appointments<sup>5</sup>.
- **United States (Medicare):** Using Markov models to simulate glaucoma progression over 20 years, Stein et al. demonstrated that initial laser treatment generates significant savings compared with monotherapy with prostaglandin analogs, identifying laser as the “dominant” strategy with favorable incremental cost-effectiveness ratio values<sup>10</sup>.
- **Canada (OHIP):** Within the Ontario public system, Lee and Hutnik projected accumulated costs over 6 years, showing that SLT becomes cheaper than most branded drug combinations within 1 year. Even compared with cheaper generics, laser treatment reaches its financial break-even point

between 13 and 40 months, representing net savings for the system thereafter<sup>11</sup> (Figure 1).

- **New Zealand:** A cost-minimization analysis by Ngan et al. reinforced that, in a public system with limited resources, SLT is superior even to subsidized drug treatments<sup>12</sup>.

However, clinical acceptance and economic evidence do not automatically eliminate management barriers. Canada’s health system provides a guideline similar to that of Brazil. In the province of British Columbia, for example, although health technology assessments recognize the value of the procedure, the actual provision of SLT is hindered by practical obstacles. Reports indicate that care is often limited by the capital costs of equipment acquisition and the rigidity of hospital budget allocations<sup>13</sup>. This difficulty in translating “theoretical coverage” into “practical access” is exactly what creates the bottleneck in our country.

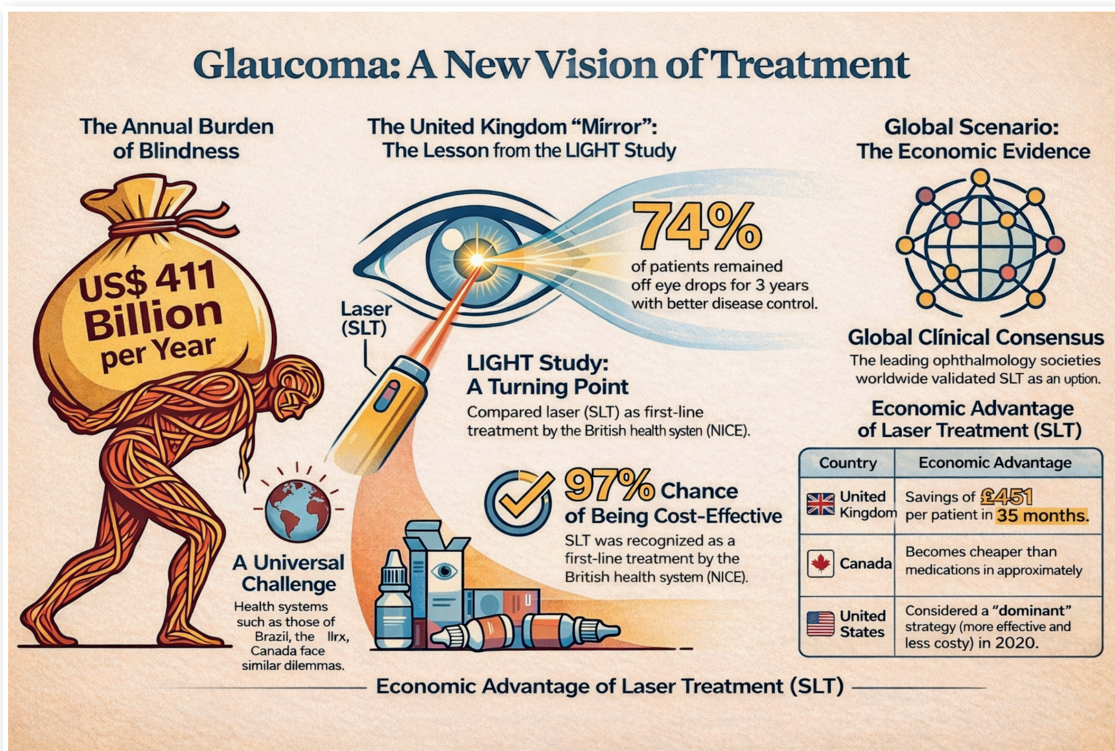
**The Brazilian reality: local evidence and the funding maze**

When we look to Brazil, the question is inevitable: if SLT is clinically superior and economically

advantageous, why is it still not the standard treatment in the SUS?

The answer does not lie in a lack of evidence. Recent national literature unanimously highlights the advantages of this technology. Tavares et al. conducted a robust budget impact analysis for the SUS, demonstrating that SLT has a significantly lower economic impact than clinical treatment with timolol and prostaglandin analogs at both 1 and 5 years after treatment. Projections indicate potential savings of billions of Brazilian reais, depending on the adoption of the technology<sup>14</sup>. In line with these findings, Gravina et al., using Markov models, concluded that initiating treatment with SLT is a dominant strategy (more effective and less costly) than eye drops, because it provides higher quality-adjusted life years for the patient<sup>15</sup>.

However, we face a complex implementation barrier: the funding architecture. Currently, the SUS Glaucoma Program favors drug treatment. The system efficiently provides medication through the “High Cost Pharmacy” (“Farmácia de Alto Custo” in Portuguese) but does not have a pathway designed to offer laser treatment as first-line therapy<sup>16</sup>. The-



**Figure 1.** Infographic showing the global impact of glaucoma, the results of the LIGHT study, and the economic advantage of selective laser trabeculoplasty (SLT) in different health systems.

re is no exclusive coding for SLT in the SIGTAP Table. Its current use in practice relies on nonspecific codes and transfers that are incompatible with the operating costs of the equipment, resulting in underfunding that discourages specialized services from adopting the technology.

Unlike cataract, which benefits from a high-productivity flow financed through FAEC or the MAC ceiling and supports a large volume of surgeries<sup>17</sup>, glaucoma remains trapped in a “chronic maintenance” model. While other countries have invested in infrastructure to decongest outpatient clinics, Brazil is still struggling to transform glaucoma from a “prescription renewal” disease into an “early intervention” one.

**The value proposition: The “balance point” for the SUS**

To overcome the obstacle posed by the SIGTAP Table, it is necessary to present a pragmatic value proposition based on “real-life” data. In this context, we recently published a proposal for a viable path forward.

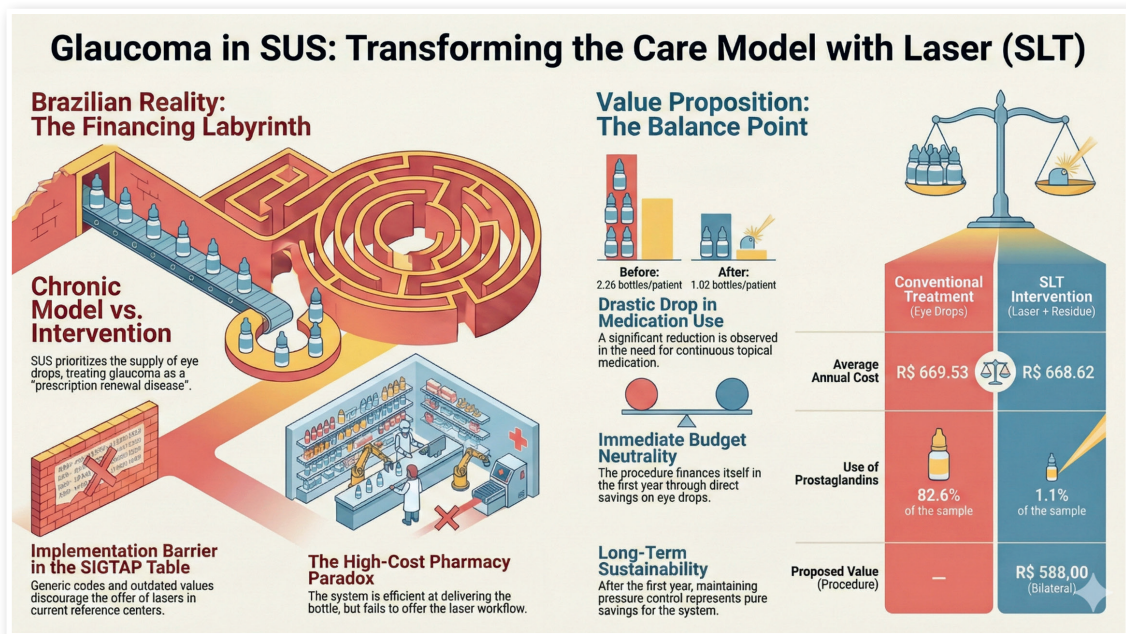
In a prospective interventional clinical study conducted within the SUS, replacing eye drops with SLT resulted in a significant reduction in the need for medication after 12 months: the average number of

vials per patient decreased from 2.26 to 1.02, with a marked reduction in the use of prostaglandin analogs (from 82.6% to 1.1% of the sample), which are the most costly medications for the government<sup>18</sup>.

Based on these data, it was possible to calculate the break-even point. While the reference group (conventional treatment) had an average annual medication cost of R\$669.53 per patient, the post-SLT group’s residual expense fell to R\$80.62. These savings allowed the proposal of a price of R\$588.00 for the bilateral SLT procedure<sup>19</sup>. Thus, the total annual cost of the intervention group (including the procedure plus residual medication) is R\$668.62, ensuring budget neutrality compared with conventional treatment in the first year (Figure 2).

This logic is powerful for public management for three reasons:

- 1. Immediate budget neutrality:** The introduction of the procedure is practically self-funding in the first year, as it is covered by direct savings from reduced use of eye drops.
- 2. Long-term savings:** Because SLT has a lasting effect, subsequent years of treatment represent a net saving for the system.
- 3. Feasibility:** The proposed price makes it feasible for accredited centers to acquire and maintain the technology.



**Figure 2.** From the funding maze to budget neutrality: the role of selective laser trabeculoplasty (SLT) in the reorganization of glaucoma care in the SUS.

## Conclusion: The role of the ophthalmologist and the manager

In view of the above, the technical conclusion is clear, but the practical application of SLT requires a review of care pathways. Officially, first-line SLT is still not the predominant practice in the SUS, which continues to prioritize medication.

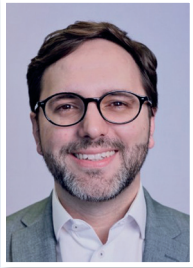
However, data from the LiGHT study, international experience, and Brazilian evidence demonstrate that we now have a golden opportunity. Transitioning to SLT not only preserves the ocular surface and improves patients' quality of life but also serves as a tool for social equity. In a country with vast regional disparities<sup>20</sup>, a single procedure that ensures IOP control represents an intervention with high social impact.

The future of public ophthalmology demands that specialists move beyond merely prescribing eye drops and become interventional glaucoma physicians. Science has already provided the path and the economic model; now it is up to public management to pave the way.

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