

# Where to draw the line? Understanding preferences in mucosal collar length after circumcision: A crowdsourced survey from the U.S. general population

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## Abstract

**Introduction:** Male circumcision is a polarizing and prevalent procedure. Little understanding exists regarding patient preferences for circumcision appearance. Our objective was to elicit how mucosal collar length may be perceived in terms of overall cosmesis and desirability among adults.

**Methods:** A questionnaire using REDCap was created and distributed through Amazon Mechanical Turk. Respondents provided demographic information and circumcision status before being challenged with artistic representations of circumcised penises with increasing lengths of mucosal collar. Participants were asked to select the most and least esthetically pleasing image, as well as rate the "importance of appearance" from 0–100. Responses were analyzed with ordinal regression models.

**Results:** Preference for shorter mucosal collars were seen in respondents with a postgraduate education ( $p=0.013$ ) and no religious affiliation ( $p=0.034$ ). In contrast, participants reporting a religious affiliation preferred longer mucosal collars ( $p=0.034$ ). Circumcised males rated appearance as being more important ( $p=0.001$ ) in contrast to uncircumcised males who did not ( $p=0.001$ ). Circumcised fathers were more likely to circumcise their sons relative to uncircumcised fathers ( $p<0.05$ ) and women preferred circumcision ( $p<0.05$ ).

**Conclusions:** Our study revealed polarized esthetic preferences in the sample as a whole, with large proportions of respondents selecting the longest or shortest collar length. Preferences regarding mucosal collar length appear to be most influenced by education and religion. Overall, our study did not observe a predominant preference for mucosal collar length following circumcision. Surgeons should engage patients and/or caregivers/parents preoperatively in discussions regarding preferences and desired cosmetic outcomes.

## Introduction

Male circumcision may be one of the most prevalent and, at times, polarizing surgeries performed across the globe. According to the World Health Organization (WHO), as many as 30% of the global male population over the age of 15 years has undergone the procedure through a ritualistic process or within a healthcare setting.<sup>1</sup>

While the existing literature has long since validated the epidemiological impact of circumcision, there is little understanding surrounding the impact or perceptions regarding the esthetics of the circumcised penis.<sup>2-4</sup> Our study aimed to elucidate how the appearance of the circumcised penis is perceived, particularly in relation to the length of the most visible portion, the mucosal collar. The mucosal collar is the "mucosal-like" appearing, less keratinized, inner-portion of the prepuce that becomes more visible when the proximal shaft skin is reapproximated with the subglandular distal penile tissue following circumcision.<sup>5</sup> The mucosal collar is a portion of the normal circumcised penile anatomy that is likely visualized without consequence or much consideration by patients, but governed by the circumcising practitioner, hence our interest in evaluating it in this study. To the best of our knowledge, evaluation of the mucosal collar has never been performed or described within the existing literature.

Nebulous professional guidelines have long been associated with and have likely influenced the practice of male circumcision. For example, the American Academy of Pediatrics and Canadian Pediatric Society both acknowledge the health benefits associated with circumcision yet provide varied viewpoints towards newborn circumcision.<sup>6</sup> In current practice, providers dictate circumcision outcomes by subjectively measuring and removing the prepuce without specific patient- or parent-focused consideration towards cosmetic outcomes other than the goal of foreskin excision. Clinicians may be missing an opportunity to identify and meet patient wishes more completely. This study employed crowdsourc-

ing of adults in the U.S. to evaluate how various lengths of mucosal collar affect perceptions of overall penile cosmesis and to examine the decision to pursue circumcision.

## Methods

This study was reviewed by our institutional internal review board and determined to meet criteria for exemption (STUDY20200742). A questionnaire was built within the REDCap® (Research Electronic Data Capture 2021) software hosted within our institution. This survey was then administered anonymously to adults ( $\geq 18$  years) from the general population residing within the U.S. through an online platform called Amazon Mechanical Turk platform (AMT; <https://www.mturk.com>). The participants were selected by filtering the eligible users who could see our survey exclusively to adults (18+) who resided within the U.S. based on their self-reported account credentials managed by AMT. AMT is a crowdsourcing tool operated under Amazon Web Services designed to recruit human users to complete tasks in exchange for monetary compensation. It is an online tool available to all U.S. adults with internet access through creation of an online account within AMT.

Respondents were asked to provide basic demographic information, including their age, race/ethnicity, gender identity, religious affiliation, and highest education level. Male respondents were asked about their circumcision status. Those with male offspring were asked about their son's circumcision status. Then respondents were presented with artistic representations of five circumcised penises (Figure 1). These illustrations were displayed in sequence and were identical except for the changes in the mucosal collar. The image representing the shortest mucosal collar was on the far left, with progressive increases in mucosal collar lengths working towards the right. These illustrations were not annotated in order to minimize potentially influencing respondents' impressions. Respondents were asked to select the illustration they found most appealing, and then least appealing of the remaining four unselected images. Lastly, respondents

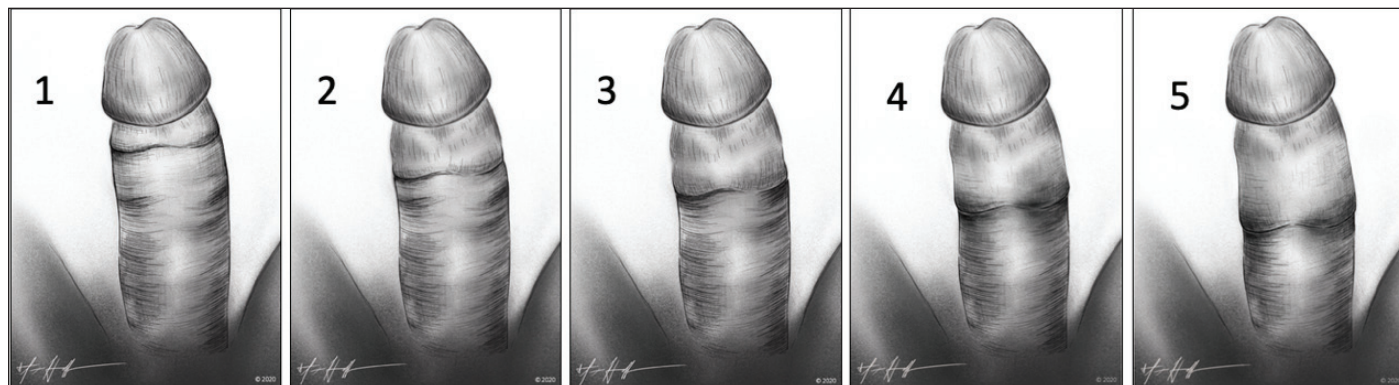
were asked to acknowledge their agreement/disagreement with the statement, "The appearance of a circumcised penis is important to me" by using a sliding scale between 0 (strongly disagree) and 100 (strongly agree).

Descriptive statistics were calculated for participant demographics, circumcision status, and mucosal collar preferences. Mucosal collar preference (i.e., the illustration selected for most/least esthetically pleasing) was analyzed using a cumulative ordinal regression model via the brms package for R.<sup>7,8</sup> Age group, gender, religious affiliation, race, and education were included as predictors, along with everyone's rating of the importance of the appearance of a circumcised penis. This analysis allowed for identification of group differences in preference towards a longer or shorter mucosal collar via the distribution of ratings across the five images.

During analysis, females were considered one group, and males were split into those who reported being circumcised and uncircumcised. Participants who responded, "not applicable" to their gender or circumcision status were excluded. Due to the relatively small sample size and variety of faiths recorded, faith was simply coded as "yes" or "no" for analysis. Individuals responding as "agnostic," "atheist," or "nothing in particular" were coded as "no." Those responding "prefer not to answer" regarding faith designation were excluded. The four largest race groups were retained (Asian, Black, Hispanic/Latino, White), and the remaining individuals were grouped under "other."

## Results

Complete responses were received from 500 users, allowing us to draw from a wide array of backgrounds, ethnicities, circumcision statuses, and opinions. Nine participants were excluded for responding "not applicable" about their gender or circumcision status, while five additional respondents were excluded for responding "prefer not to answer" for their faith designation. Following exclusions, information from 486 respondents was included in our final data and analysis.



**Figure 1.** Artistic illustrations of five circumcised penises with progressively increasing lengths of mucosal collar relative to penile shaft skin length (from left to right).

**Table 1. Demographic information (N=486)**

	% (n)
Age group	
18–24	4.5% (22)
25–34	40% (194)
35–44	29% (139)
45–54	14% (68)
55–64	8% (39)
65	4.9% (24)
Gender/circumcision status	
Female	44% (212)
Male uncircumcised	13% (65)
Male circumcised	43% (209)
Children	
No children	52% (255)
No sons	9.3% (45)
Uncircumcised son(s)	11% (54)
Circumcised son(s)	27% (132)
Race/ethnicity	
American Indian or Alaskan Native	0.82% (4)
Asian	8.4% (41)
Black or African American	8.8% (43)
Hispanic or Latino or Spanish origin of any race	4.5% (22)
Native Hawaiian or other Pacific Islander	0.41% (2)
Prefer not to answer	0.21% (1)
Two or more races	2.3% (11)
White	74% (362)
Education	
Bachelor's/associates degree	55% (266)
Master's degree or higher	12% (60)
Some college	22% (108)
Some high school, high school graduate	11% (52)
Religion	
Agnostic (not sure if there is a God)	19% (92)
Atheist (do not believe in God)	20% (96)
Buddhist	1.4% (7)
Catholic (including Roman Catholic and Orthodox)	16% (77)
Christian	21% (101)
Christian Orthodox	1% (5)
Hindu	0.41% (2)
Jewish	1.2% (6)
Muslim	0.82% (4)
Nothing in particular	9.5% (46)
Other	1.2% (6)
Protestant (United Church of Canada, Anglican, Orthodox, Baptist, Lutheran)	8.8% (43)
Sikh	0.21% (1)

A total of 201 participants (40.3% of respondents) were within the 25–34-year-old age group, representing the largest cohort (Table 1). Most participants identified as male (n=274, 54.8%) vs. female (n=218, 43.6%), with the remaining eight (1.6%) comprised of self-reported transgender female, trans-

**Table 2. Characteristics of respondents with children (N=486)**

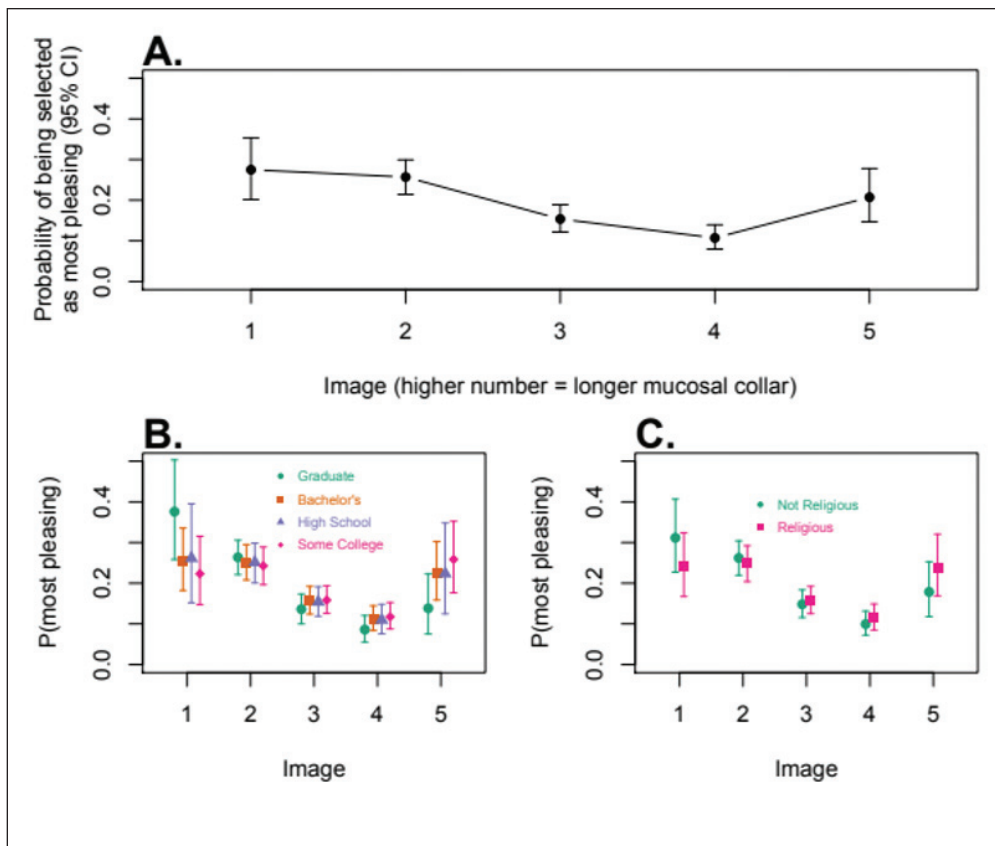
	% (n)
Do you have children?	
No	52% (255)
Yes	48% (231)
Do you have male children?	
Not relevant	52% (255)
0	9.3% (45)
1	22% (106)
2	12% (58)
3	3.1% (15)
4	0.41% (2)
5	1% (5)
Are your sons circumcised?	
Not relevant	62% (300)
No	11% (54)
Yes	27% (132)
Age son(s) were circumcised	
Not relevant	73% (354)
0–2 months	20% (98)
1–12 years	2.9% (14)
13–17 years	0.82% (4)
18 and older	0.21% (1)
2 months to 1 year	2.9% (14)
Uncertain	0.21% (1)
Are you circumcised?	
Not relevant/not answered	44% (212)
No	13% (65)
Yes	43% (209)
Age you were circumcised	
Not relevant	57% (277)
0–12 years (childhood)	40% (194)
13–17 years (adolescence)	2.7% (13)
18+ years (adulthood)	0.41% (2)

gender male, gender variant/non-conforming, or prefer not to answer (Table 1).

A significant majority of respondents identified as White/Caucasian (n=370, 74%), while Black/African American, Asian, Hispanic/Latinx, multiracial, American Indian/Alaskan, Hawaiian/Pacific Islander, or unknown represented 45 (9%), 42 (8.4%), 22 (4.4%), 13 (2.6%), four (0.8%), two (0.4%), and two (0.4%) participants, respectively (Table 1). Inquiries regarding participants faith produced a wide array of responses.

Four faith preferences represented three-quarters of all responses: Christian (n=101, 20%), atheist (n=100, 20%), agnostic (n=92, 18.2%), and Catholic (n=77, 15.4%) (Table 1). Buddhism, Christian Orthodox, Hindu, Judaism, Islam, Protestant, no particular faith, and other comprised the remaining 130 (26%) respondents (Table 1).

Regarding education, 276 (54.9%) reported having a bachelor's degree, 62 (12.5%) reported having a master's



**Figure 2.** (A) Estimated probability of selecting an image as most pleasing (and 95% confidence intervals) for the sample as a whole; (B) results broken down by education level showing a shift in ratings to shorter collars in those with a graduate degree; (C) results split by religious identification showing a preference for longer collars among the religious vs. the non-religious.

degree or higher, 110 (22%) reported having completed some college education, and 52 (10.4%) respondents reported having completed some high school education (Table 1).

Slightly fewer than half of respondents, 235 (47.4%), reported having children of their own. Of those with children, 111 (46.3%) reported one son, 59 (24.6%) had two, and 23 (9.6%) had three or more sons (Table 2). Most respondents with male children had their sons circumcised (n=62, 78%) and most (n=103, 75.7%) had it done within the newborn period (0–2 months of age) (Table 2).

Figure 2A demonstrates a bias towards selecting shorter mucosal collars (Figure 1, images 1, 2) as most pleasing. Nevertheless, the image associated with the longest collar (Figure 1, image 5) was also selected at a high rate. Images 1, 2, and 5 did not significantly differ in the probability of being assigned most pleasing (1 vs. 2:  $p=0.71$ ; 1 vs. 5:  $p=0.33$ ; 2 vs. 5:  $p=0.29$ ), however, were significantly more likely to be selected than images 3 or 4 (1 vs. 3:  $p=0.008$ ; 1 vs. 4:  $p=0.001$ ; 2 vs. 3:  $p=0.002$ ; 2 vs. 4:  $p=0.001$ ; 4 vs. 5:  $p=0.001$ ). The one exception to this was between images 3 and 5, which did not illustrate a significant difference in preference when being compared ( $p=0.11$ ).

Focusing on differences between demographics, respondents with a graduate degree showed a bias towards preferring shorter mucosal collars relative to the other education categories ( $p=0.013$ ) (Figure 2B). Furthermore, those reporting a religious affiliation exhibited a preference for longer collars relative to the non-religious respondents, who showed a preference towards shorter collars ( $p=0.034$ ) (Figure 2C). Consistent with this preference, the non-religious respondents selected the longer collars as least pleasing ( $p=0.002$ ) (Figure 3).

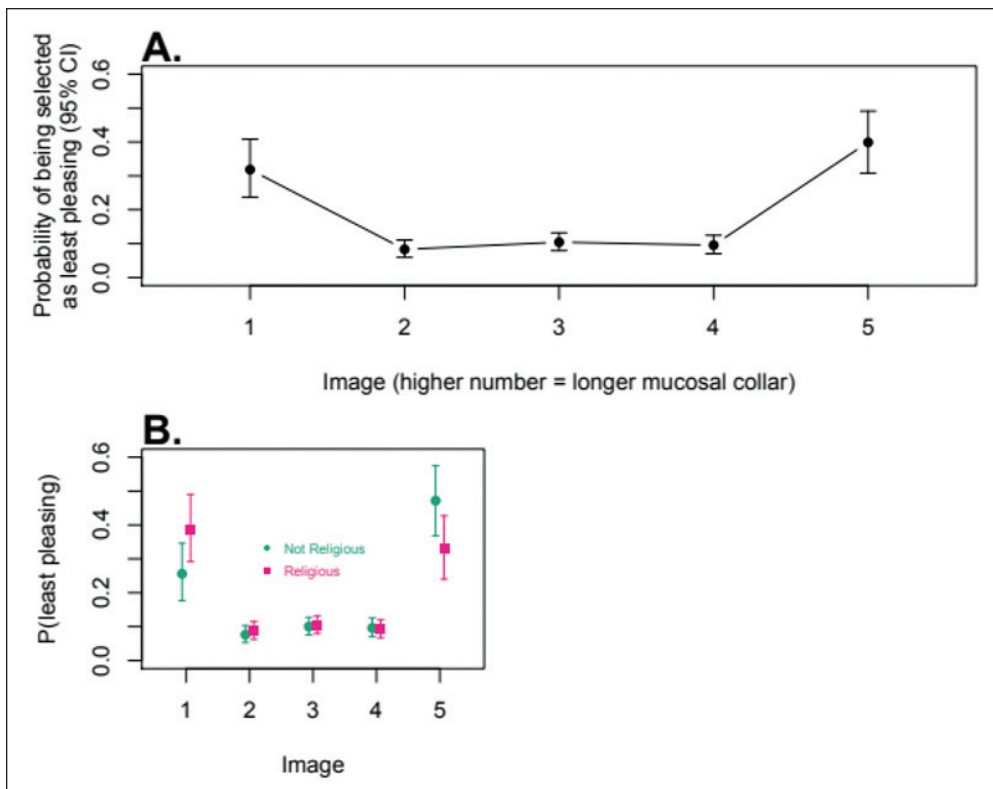
## Discussion

Male circumcision remains prevalent within the U.S. This is largely due to nearly a century of evangelical Christian influence surrounding male child-birth, as well as the influence of modern medical practice.<sup>9</sup> While research and clinical evidence have demonstrated the reduced morbidity associated with male

circumcision, gradual changes in perspective and preference have begun to challenge the practice of male circumcision. Subtle but decreasing trends among circumcision rates prior to hospital discharge (64.5% to 58.3% between 1979 and 2010, respectively) illustrate the subtle ebb and flow of male circumcision, likely related to social perceptions and preferences that underlie much of the contemporary discussion.<sup>10</sup>

Individuals with advanced degrees may be more attuned to and appreciative of the risks and benefits of circumcision, leading to more fluid access to make their ultimate decision for or against the procedure. Furthermore, external forces known to influence circumcision status globally (sexually transmitted infection rates, access to safe medical care, ritualistic demands, etc.) have not generated identical pressure within the developed world and likely influence decision-making differently. While not the focus of our study, education likely does contribute to circumcision rates; however, the degree to which it impacts the cosmetic outcome remains unclear. In the setting of our study, with a sample entirely within the U.S., individual circumcision preferences tend towards the extremes of mucosal collar length and cannot be easily predicted by educational status alone.





**Figure 3.** (A) Estimated probability of selecting an image as least pleasing (and 95% confidence intervals) for the sample as a whole; (B) results split by religious identification showing a bias against longer collars among the non-religious vs. the religious.

The strongest known reported influence on circumcision rates has been the circumcision status of the father.<sup>11,12</sup> Rediger et al demonstrated this within a prospective review of expecting parents, noting that among children born to circumcised fathers, 82% were likely to undergo circumcision as compared to only 15% of children born to uncircumcised fathers.<sup>12</sup> Analysis from our survey corroborates this finding in that 78% of circumcised fathers had their son circumcised compared to only 18% of uncircumcised males ( $p < 0.05$ ).

While our study did not illustrate strong preferences for mucosal collar length, there were slight preferences towards shorter collars. Despite this, a substantial proportion also favored the longest collar. The reason for these varied preferences is likely multifactorial and could not be fully evaluated due to the small sample size within this study. While a relationship between advanced parental education and higher circumcision rates has been reported within the literature, it remains unclear what specifically may be contributing to this preference and what impact parental education may have with regards to circumcision appearance.<sup>11</sup> Our study demonstrated a preference for shorter collars in respondents with a graduate degree. Similarly, certain faiths (i.e., Judaism and Islam) have institutionalized the practice of circumcision, yet do not distinctly identify a preferred appearance. Our respondents reporting a religious affiliation indicated

a preference towards longer collars, whereas those without religious affiliations reported a preference towards shorter collars. Female respondents within our survey did not demonstrate a significant preference in collar appearance ( $p = 0.199$ ), which likely reflects similarity to their partner(s).

The challenge with assessing esthetic perceptions of the circumcised penis is that it is likely most respondents have had limited exposure to the alternatives. Individuals are limited to their own appearance or to that of their partner(s), and understandably may also become biased for any number of social and individual reasons. Typically, the experience of circumcision is defined by whether it happens or not, and not by the ultimate cosmetic outcomes. The decision to perform circumcision is likely to always be a personal decision sourced from many social

and personal factors. While we ultimately identified certain demographic features that may be associated with slight shifts in overall preference for mucosal collar appearance following circumcision, it remains difficult to articulate if any definitive preference exists or is clinically relevant.

### Limitations

Our study is limited by the illustrations at the core of our survey. To reduce potential racial bias, black and white illustrations with minimal artistry and detail (pubic hair, angulation, vasculature, etc.) were commissioned in lieu of explicit photographic or color representations. Additionally, our illustrations may fail to capture opinions and perspectives of the mucosal collar in the flaccid vs. erect state we presented, as its appearance can vary between rigid and flaccid states. Further limitations stem from the nature of our survey being anonymous and preventing any additional followup with respondents to review the reasoning or logic to their answers. Data collected from surveys can be influenced by variation in question interpretation, loss of interest, or lack of honesty. Respondents were also limited to the U.S. only, which generally has a population bias towards circumcision and likely represents different preference towards the esthetics of circumcision when compared to the rest of the world.

While a modest sample size, it was inadequate to detect strong preferences among this diverse respondent group if one truly existed. Furthermore, because respondents were paid to answer the survey, there may also have been a selection bias inherent within the results.

## Conclusions

Despite a slight preference towards shorter mucosal collars in our study, it is difficult to ascertain if there are any clinically significant esthetic preferences for mucosal collar lengths in circumcision. While no clear preferential length was identified, practitioners should always engage parents and patients in discussions surrounding the risks and benefits of circumcision and remain mindful of parent and patient preferences and desired outcomes. Further studies are needed to identify if there are trends towards preferred collar lengths in circumcision that exist beyond the U.S.

**Competing interests:** The authors do not report any competing personal or financial interests related to this work.

This paper has been peer-reviewed.

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