Medical Male Circumcision disciplines the penis: understanding HIV susceptibility

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BACKGROUND

• Voluntary medical male circumcision (VMMC) has demonstrated a 60% reduction in male vulnerability to HIV infection. However, the biological mechanisms by which circumcision confers this protection remain poorly understood.

• Aims: a) to measure changes in penile skin integrity after VMMC and b) to measure how asymptomatic sexually transmitted infections (aSTIs) alter skin barrier function.

• Hypotheses: 1) There is improved in vivo skin barrier integrity of the glans of the penis after VMMC; 2) that the presence of an aSTI results in lower in vivo penile skin barrier integrity before and after VMMC.

METHODS

Skin barrier integrity was assessed by measuring transepithelial water loss (TEWL) using a Vapometer (n=48 adult males; 18-35 yrs) and hydration values using a Moisture SC meter (n=31 adult males) at three main penile sites: glans, inner foreskin and shaft as annotated below.

RESULTS

Prior to circumcision, the inner foreskin and glans had higher TEWL (Figure 1A) readings of 34.66 (IQR: 17.73) & 35.30 (IQR: 17.59) compared to shaft reading 14.85 (IQR: 8.07; q<0.0001), whereas the surface hydration (Figure 1B) was the same across all regions.

Two weeks after VMMC, the glans TEWL (Figure 2A) significantly decreased (q=0.0088) from a median of 35.45 (IQR: 17.32) to 24.58 g/hr/m² (IQR: 18.62), becoming comparable to penile shaft readings. Surface hydration (Figure 2B) also significantly decreased in all penile sites (q<0.05).

TEWL comparisons between STI negative vs STI positive men (n=22 vs 6) before VMMC showed a significant lower TEWL in the glans from STI positive men: median of 35 vs 8.8 g/hr/m²; q=0.0083.

DISCUSSION & CONCLUSION

• Prior to VMMC, the glans and inner foreskin have lower skin barrier integrity compared with the penile shaft and may be linked with HIV susceptibility in uncircumcised males.

• In the absence of an aSTI, VMMC significantly increases glans skin integrity (as measured by TEWL) and decreases water content at all penile sites measured (as measured by surface hydration).

• Contrary to our hypothesis, our preliminary data suggests that the presence of an STI results in higher glans skin integrity before VMMC.

Our initial findings suggest increased penile skin barrier integrity & function after VMMC is one potential mechanism underlying the efficacy of medical male circumcision in men without an asymptomatic STI.