Circumcision for the prevention of urinary tract infection in boys

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Phimosis

- Primary (physiological)
- Secondary (pathological): balanitis xerotica obliterans (BXO)

Phimosis

Preputial adhesion

Balanitis xerotica obliterans (BXO)

Phimosis

- At the end of the first year of life: 50%
- Until 3 – 4-year-olds: 89%
- 6 - 7-year-olds: 8%
- 16 - 18-year-olds: 1%

Indication for circumcision

- Absolute indication: secondary phimosis (BXO).
- The indications in primary phimosis:
  - Recurrent balanoposthitis
  - Recurrent urinary tract infections with urinary tract abnormalities (LE: 2; GR: B) such as vesicoureteric reflux, posterior urethral valves, neurogenic bladder

Contraindications for circumcision

- Coagulopathy
- Acute local infection
- Congenital anomalies of the penis: hypospadias, buried penis, penile curvature and webbed penis

Benefits and complications

- ***Benefits***: the prevention of penile cancer, UTI, STDs (HIV infection), balanitis, and phimosis.
- ***Complications***: bleeding, excessive skin excision (penile chordee, torsion, and lateral deviation, trapped penile), glanular adhesions and skin bridges, meatal stenosis, penile trauma(urethral injury, excision of the glans and/or penile shaft, and penile necrosis).

Urinary tract infection (UTI)

- The first year of life is the only year during which males have more UTIs than females.
- 50/100,000 children/year are hospitalized for UTI; greater than 3 times in infants
- Preputial aerobic bacterial colonization is highest during the first months after birth, decreases after 6 months, and is uncommon after age 5 years

Urinary tract infection (UTI)

- 2.2% to 4.1% UTI in infant boys
- 70% to 86% occurring in uncircumcised infants *(Wiswell et al, 1985; Schoen et al, 2000; Wiswell, 2000)*
- The relative risk of UTI in uncircumcised male infants increased in 3.12 times circumcised boys

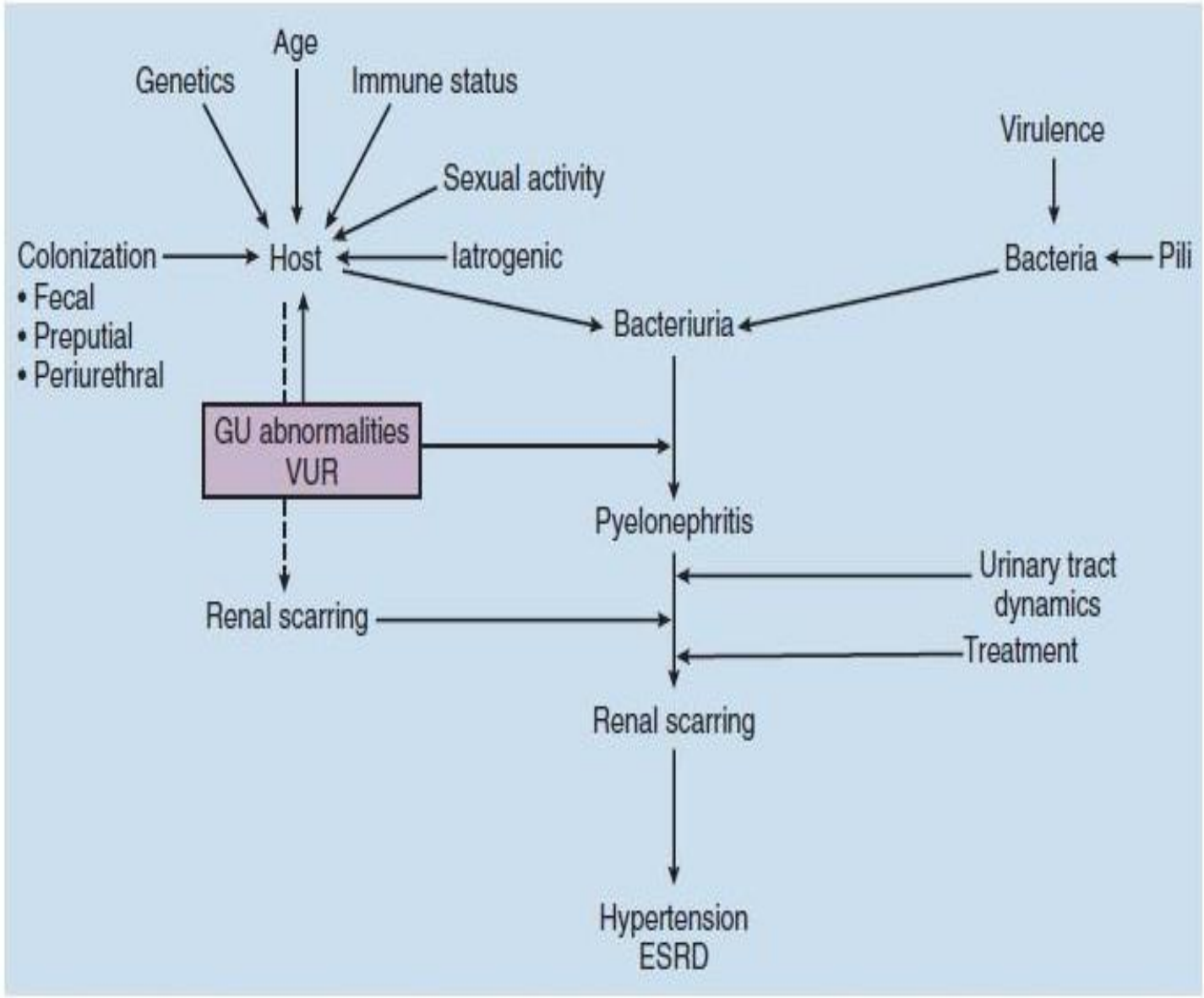


Figure 116–3. Factors that affect the development of bacteriuria and subsequent pyelonephritis, renal scarring, hypertension, and end-stage renal disease (ESRD). Urinary tract urodynamics reflect urinary tract pressures and related factors. GU, genitourinary; VUR, vesicoureteral reflux.

The effect of circumcision on urinary tract infection in boys

- Guidelines on Paediatric Urology *(European Association of Urology 2013)*
- Circumcision for the prevention of urinary tract infection in boys: a systematic review of randomised trials and observational studies *(D Singh-Grewal, J Macdessi, J Craig, Arch Dis Child 2005;90:853–858)*

Table 1 Characteristics of included studies that have examined the effect of circumcision on urinary tract infection in male subjects

Study design	Reference	Year	Country	Setting	n	No of UTI episodes	Age (months, years)
RCT	Nayir[21]	2001	Turkey	Hospital outpatients	70	3	3 months to 10 years
Cohort studies	Schoen *et al*[22]	2000	USA	Hospital in/outpatient	14 893	154	<1 year
	To *et al*[1]	1998	Canada	Hospital in/outpatient*	58 434	330	<3 years
	Wiswell and Hachey[6]	1993	USA	Hospital inpatient	107 598	496	<1 year
	Wiswell *et al*[5]	1987	USA	Hospital inpatient	219 775	610	<1 year
Case–control studies	Craig *et al*[23]	1996	Australia	Hospital in/outpatient	886	144	<5 years
	Newman *et al*[24]	2002	USA	Non-hospital outpatients	769	56	<3 months
	Rushton and Majd[25]	1992	USA	Hospital inpatient	86	23	<6 months
	Spach *et al*[26]	1992	USA	Community sexually transmitted diseases clinic	78	26	Adult
	Crain and Gershel[27]	1990	USA	Hospital outpatient	81	22	<2 months
	Kashani and Faraday[28]	1989	USA	Hospital inpatient	126	17	1 month to 2 years
	Herzog[29]	1989	USA	Hospital outpatient	112	36	<1 year

*Outpatient data not included in analysis as they did not accurately define UTI events.
RCT, randomised controlled trial; UTI, urinary tract infection.

Table 2 Quality of cohort studies examining the effect of circumcision on urinary tract infection in male subjects

Reference	Definition of UTI	Determination of circumcision status	Exclusion criteria	Follow up	Adjustment for confounding variables		
					Age	SES	Ethnicity
Schoen *et al*[22]	$>10^8$/l pure growth in 90% from any means of collection Source unknown in 4% Determined by retrospective database search and confirmed by review of case records of random selection of 52 cases	Inpatients: ICD-9 coding for circumcision in neonatal hospital stay Outpatients: ICD-9 from KPNC database for outpatient circumcision	Patient not within health plan for full duration of study	<1 year	No	No	No
To *et al*[1]	Inpatients: ICD-9 coding (kidney infection, cystitis, urethritis or urinary tract infection) Outpatients: OHIP data Determined by retrospective database search	The Canadian classification procedure code during the first month of life	Older than 1 month of age at time of circumcision, multiple birth, stillbirth, birth complications and lack of health care number	2–3 years for inpatient cases <1 year for outpatient cases	No	Yes	No
Wiswell and Hachey[6]	Not specified Determined by retrospective database search	US Army patient administration systems and biostatistics activity database	Bag urine specimen, congenital abnormality, or predisposition to UTI (not specified)	<1 year	No	No	No
Wiswell *et al*[5]	Not specified Determined by retrospective database search	US Army patient administration systems and biostatistics activity database	Congenital abnormality or predisposition to UTI (not specified)	<1 year	No	No	No

ICD-9, *International Classification of Diseases*, 9th revision; KPNC, Kaiser Permanente Medical Care Program, Northern California, USA; OHIP, Ontario Health Insurance Plan; SES, socioeconomic status.

Table 3 Quality of case–control studies examining the effect of circumcision on urinary tract infection in male subjects

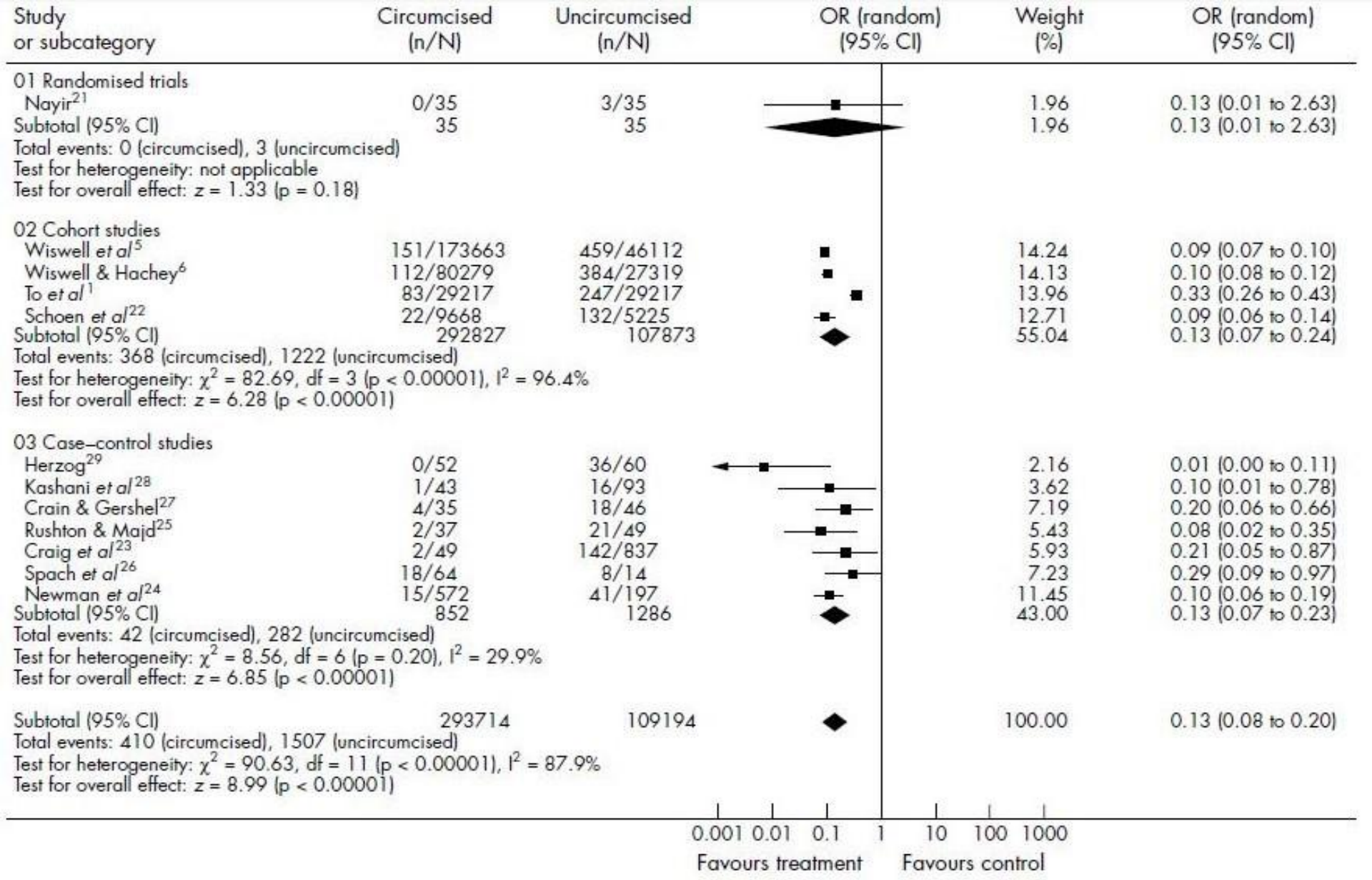
Reference	Definition of UTI	Determination of circumcision status	Exclusion criteria	Origin of controls	Adjustment for confounding variables		
					Age	SES	Ethnicity
Newman *et al*[24]	Bag urine or clean catch $\geq 10^7$/l CSU $\geq 2\times10^6$/l SPA $\geq 10^4$/l	Standard questionnaire	No fever >38°C or urine collected at presentation Uncertain circumcision status	Patients presenting to non-hospital outpatients with a fever	No	No	No
Craig *et al*[23]	CSU/SPA $\geq 10^6$/l MSU $\geq 10^8$/l	Direct questioning of parents or direct examination	Past history of UTI or urinary tract abnormality; neurological or skeletal abnormality predisposing to UTI	Patients presenting to hospital emergency department for any reason other than those diagnosed with UTI	Yes	No	No
Rushton and Majd[25]	MSU $\geq 10^8$/l CSU $\geq 10^7$/l	Cases: "prospectively" found but not specified Controls: documentation in medical record but no further details given	Prolonged neonatal hospital admission or uncertain circumcision status	Patients admitted with febrile upper respiratory tract infection. Matched for age, race, and SES	No	Yes	Yes
Spach *et al*[26]	MSU $>10^6$/l growth along with one or more symptoms	Examination	No clear exclusion criteria	Patients without bacteriuria presenting to outpatient clinic	Yes	No	Yes
Crain and Gershel[27]	Bag urine $\geq 10^4$/l CSU $\geq 10^4$/l SPA $\geq 10^2$/l	Documentation in medical records no further details given	Absence of fever	Patients presenting to hospital with fever and without a discharge diagnosis of UTI	No	No	No
Kashani and Faraday[28]	CSU/SPA $\geq 10^8$/l	Documentation in medical record	Urinary tract abnormality, inadequate documentation of specimen type or age <1 month	Patients presenting to outpatients clinics for unrelated reasons	No	No	Yes
Herzog[29]	CSU/SPA $\geq 10^7$/l	Documentation in medical record or direct contact with family if unclear in medical records	Anatomical abnormality, past history of UTI, myelodysplasia, uncertain circumcision status or race, and equivocal culture results	Patients who presented to emergency with a febrile illness and had a SPA or CSU which was negative	Yes	Yes	Yes

CSU, catheter specimen of urine; MSU, midstream urine; SES, socioeconomic status; SPA, suprapubic aspirate; UTI, urinary tract infection.

Table 4 Benefit versus harm for circumcision in preventing urinary tract infection in boys at different levels of risk for UTI per 1000 boys, assuming a complication rate of 2% and an odds ratio of 0.13

Patient group	Risk of UTI	UTI in uncircumcised (n)	UTI in circumcised (n)	UTI prevented by circumcision (n)	Complications of circumcision (n)
Normal	1%	10	1	9	20
Past UTI	10%	100	13	87	20
High grade VUR	30%	300	39	261	20

OR, odds ratio; UTI, urinary tract infection; VUR, vesicoureteric reflux.



Meta-analysis of studies examining the effect of circumcision on urinary tract infection

Arch Dis Child 2005;90:853–858. doi: 10.1136/adc.2004.049353

Circumcision and Lifetime Risk of Urinary Tract Infection: A Systematic Review and Meta-Analysis

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Purpose

Urinary tract infection is common in infant males who are uncircumcised and can lead to renal parenchymal disease of the still growing pediatric kidney. Although the rate of urinary tract infection is highest in the first year of life, the cumulative incidence during the rest of the lifetime is under-recognized, but is expected to be nontrivial. Thus, any intervention that might prevent urinary tract infection would be expected to reduce suffering and medical costs.

Materials and Methods

We conducted a meta-analysis of 22 studies examining the single risk factor of lack of circumcision, then determined the prevalence and relative risk of urinary tract infection in different age groups (0 to 1, 1 to 16 and older than 16 years). From these data we estimated the lifetime prevalence.

Results

For age 0 to 1 year the relative risk was 9.91 (95% CI 7.49–13.1), for age 1 to 16 years RR was 6.56 (95% CI 3.26–13.2) and for older than 16 years it was 3.41-fold (95% CI 0.916–12.7) higher in uncircumcised males. We then calculated that 32.1% (95% CI 15.6–49.8) of uncircumcised males experience a urinary tract infection in their lifetime compared with 8.8% (95% CI 4.15–13.2) of circumcised males (RR 3.65, 95% CI 1.15–11.8). The number needed to treat was 4.29 (95% CI 2.20–27.2).

Conclusions

The single risk factor of lack of circumcision confers a 23.3% chance of urinary tract infection during the lifetime. This greatly exceeds the prevalence of circumcision complications (1.5%), which are mostly minor. The potential seriousness of urinary tract infection supports circumcision as a desirable preventive health intervention in infant males.

Cohort study on circumcision of newborn boys and subsequent risk of urinary-tract infection

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Summary

Background

A decrease in risk of urinary-tract infection is one of the most commonly given reasons for circumcision of newborn boys. Previous studies have reported rates of UTI to be 10–20 times higher in uncircumcised than in circumcised boys. This population-based cohort study followed neonates in Ontario, Canada, prospectively to study the relation between circumcision and subsequent UTI risk.

Methods

Eligible boys were born to residents of Ontario between April 1, 1993, and March 31, 1994. We used hospital discharge data to follow up boys until March 31, 1996.

Findings

Of 69 100 eligible boys, 30 105 (43·6%) were circumcised and 38 995 (56·4%) uncircumcised. 888 boys circumcised after the first month of life were excluded. 29 217 uncircumcised boys were matched to the remaining circumcised boys by date of birth. The 1-year probabilities of hospital admission for UTI were 1·88 per 1000 person-years of observation (83 cases up to end of follow-up) in the circumcised cohort and 7·02 per 1000 person-years (247 cases up to end of follow-up) in the uncircumcised cohort ($p < 0·0001$). The estimated relative risk of admission for UTI by first-year follow-up indicated a significantly higher risk for uncircumcised boys than for circumcised boys (3·7 [2·8–4·9]). 195 circumcisions would be needed to prevent one hospital admission for UTI in the first year of life.

Interpretation

Although our findings support the notion that circumcision may protect boys from UTI, the magnitude of this effect may be less than previously estimated.

Effect of circumcision on incidence of urinary tract infection in preschool boys.

Craig JC[1], Knight JF, Sureshkumar P, Mantz E, Roy LP.
Author information

Abstract

OBJECTIVE:

To determine whether circumcision decreases the risk of symptomatic urinary tract infection (UTI) in boys less than 5 years of age.

STUDY DESIGN:

A case-control study (1993 to 1995) in the setting of a large ambulatory pediatric service. Case subjects and control subjects were drawn from the same population. One hundred forty-four boys less than 5 years of age (median age, 5.8 months) who had a microbiologically proven symptomatic UTI (case subjects), were compared with 742 boys (median age, 21.0 months) who did not have a UTI (control subjects). The proportion of case and control subjects who were circumcised in each group was compared with the use of the chi-square test, with the strength of association between circumcision and UTI expressed in terms of an odds ratio. To determine whether age was a confounder or an effect-modifier, we stratified the groups by age (< 1 year; > or = 1 year) and analyzed by the method of Mantel-Haenszel.

RESULTS:

Of the 144 preschool boys with UTI, 2 (1.4%) were circumcised, compared with 47 (6.3%) of the 742 control subjects (chi-square value = 5.6; p = 0.02; odds ratio, 0.21; 95% confidence intervals, 0.06 to 0.76). There was no evidence that age was a confounder or modified the protective effect of circumcision on the development of UTI (Mantel-Haenszel chi-square value = 6.0; p = 0.01; combined odds ratio, 0.18; 95% confidence intervals, 0.05 to 0.71; Breslow-Day test of homogeneity chi-square value = 0.6; p = 0.4).

CONCLUSIONS:

Circumcision decreases the risk of symptomatic UTI in preschool boys. The protective effect is independent of age.

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What is the effect of circumcision on risk of urinary tract infection in boys with posterior urethral valves?

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Abstract

Purpose

Boys with posterior urethral valves (PUV) have increased risks of urinary tract infection (UTI) voiding dysfunction and ongoing renal damage. Circumcision has been shown epidemiologically to reduce UTIs, but no trial has yet confirmed this in PUV. Circumcision is not routinely performed in boys with PUV in our unit, but one quarter of our patients are circumcised for religious reasons. It may be hypothesized that circumcision reduces the risk of subsequent urinary tract infection in boys with PUV. This study aims to test this hypothesis by comparing the risk of UTI, and subsequent renal outcome, in PUV in uncircumcised boys with those who were circumcised.

Methods

A retrospective cross-sectional case note review of boys with PUV was performed, and the following were documented: age at presentation, method of diagnosis, method of treatment, initial renal status, and timing of treatment; use and timing of urinary tract diversion; timing of circumcision; and UTIs—date, organism, and treatment.

Results

Seventy-eight patients were identified, mean age 6.7 years (range, 1-18). These boys experienced 78 UTIs in the uncircumcised state. Subsequently, 27 were circumcised, experiencing 8 UTIs. Eighteen boys were diverted. The incidence of UTI was reduced from 0.50 ± 0.14 (mean ± SEM) UTIs annually uncircumcised to 0.09 ± 0.02 (mean ± SEM) circumcised ($P < .01$, Student's t test).

Conclusion

In PUV, circumcision reduces the incidence of UTI by 83%, every circumcision prevents 1 UTI on average. Early circumcision in all PUV is beneficial, but a larger randomised control trial should be considered to confirm this.

Guidelines on Paediatric Urology

Recommendations	LE	GR
In primary phimosis, conservative treatment with a corticoid ointment or cream has a success rate more than 90%.	1	A
In primary phimosis, recurrent balanoposthitis and recurrent UTI in patients with urinary tract abnormalities are indications for active intervention.	2	A
Secondary phimosis is an absolute indication for circumcision.	2	A
Paraphimosis is an emergency situation and treatment must not be delayed. If manual reposition fails, a dorsal incision of the constrictive ring is required.	4	A
Routine neonatal circumcision to prevent penile carcinoma is not indicated.	2	B

Conclusion

- Circumcision reduces the risk of UTI significantly
- The indication of circumcision: BXO, recurrent UTI, high risk of UTI (vesicoureteric reflux grade III - IV, posterior urethral valves, neurogenic bladder)
- No routine circumcision in normal boys in prevent UTI

Thank you for your attention!