

Adult-Acquired Hidden Penis in Obese Patients: A Critical Survey of the Literature

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Context: Hidden penis is anatomically defined by a lack of firm attachments of the skin and dartos fascia to the underlying Buck fascia.

Objective: To critically appraise the research evidence that could support the most effective surgical techniques for adult-acquired hidden penis in obese patients.

Methods: Studies investigating patients with a diagnosis of hidden penis were identified. Of these studies, only those with adult patients classified as overweight or obese (body mass index >25) were included in the review. Three reviewers examined the abstracts of the studies identified in the initial Medline search, and abstracts considered potentially relevant underwent full-text review. Studies that included patients with congenital, iatrogenic (eg, circumcision issues or aesthetic genital surgery), or traumatic causes of hidden penis were excluded. Studies that did not define the diagnostic criteria for hidden penis were excluded to minimize the risk of definition bias. The quality of evidence for each study was determined after considering the following sources of bias: method of allocation to study groups, data analysis, presence of baseline differences between groups, objectivity of outcome, and completeness of follow-up. Using these criteria, studies were then graded as high, moderate, or low in quality.

Results: Seven studies with a total of 119 patients met the inclusion criteria. All but 1 of the studies were nonrandomized. One study provided a clear presentation of results and appropriate statistical analysis. Six studies accounted for individual-based differences, and 1 study failed to account for baseline differences altogether. Four studies addressed follow-up. One study was of high quality, 2 were of moderate quality, and 4 were of low quality.

Conclusion: Building a clinical practice guideline for the surgical management of hidden penis has proven difficult because of a lack of high-quality, statistically significant data in the research synthesis. The authors elucidate the challenges and epitomize the collective wisdom of surgeons who have investigated this problem and emphasize the need for rigorous evaluative studies.

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In 1919, Edward Loughborough Keyes, MD, described a condition in which the penis is concealed within the subcutaneous tissues of the perineum.¹ Recent attention has been given to adult-acquired hidden penis, a condition in which the penis is buried beneath the suprapubic subcutis. In adults, hidden penis is most often the result of obesity or penoscrotal lymphedema.^{2,3} Although several classification systems exist, the terms *hidden*, *buried*, *concealed*, *trapped*, and *inconspicuous* are used interchangeably to describe this condition throughout the literature.⁴ Regardless of the term used, authors describe obese patients who have visible and functional decreases in penile length due to excessive suprapubic weight.⁵

Although morbid obesity plays an important role in the pathophysiology of hidden penis, it is not pathognomonic, suggesting a multifactorial origin. Specifically, an abnormal mobility of the dartos fascia and an inadequate attachment to the Buck fascia are implicated.⁶ Two secondary complications arise that restrict penile mobility. Excess pubic fat effectively traps the penis because the corpora are fixed to the symphysis, and moisture in the closely opposed skin surfaces incites a chronic inflammatory dermatitis with scarring.⁷ These complications are formidable challenges for the surgeon.

Determining the best surgical approach to hidden penis on the basis of the literature is hampered by a lack of consensus, the existence of multiple algorithms, and reports of variable success. Using an algorithmic approach, Pestana et al⁸ reviewed release techniques, including scar and suspensory ligament release. On the basis of their findings, the authors recommended panniculectomy when necessary. Notably, Pestana et al⁸ emphasized reconstructive techniques that used well-vascularized soft tissue. King et al⁹ addressed hidden penis with a similar algorithm but advocated suprapubic lipectomy rather than panniculectomy. When necessary, this group restored soft tissue integrity with free-skin grafts. Tang et al¹⁰ included techniques such as escutcheonectomy and split-thickness grafts secured with fibrin glue.

Considering the growing prevalence of obesity in the United States,¹¹ a relative paucity of literature exists describing adult-acquired hidden penis. Our primary objective was to critically appraise the research evidence that could indicate which surgical practices are effective for adult patients with hidden penis. Our secondary objective was to identify the surgical techniques used in the management of this condition.

Methods

The current review was carried out using a protocol based on methods for rating the quality of the evidence promulgated by the Agency for Healthcare Research and Quality (AHRQ).¹² Under its Evidence-based Practice Centers Program, the AHRQ extensively analyzed 12 scales or checklists concerned with grading observational studies to arrive at a set of high-performing scales on which individual studies may be compared. According to the AHRQ, acceptable systems for assessing the quality of observational studies should consider the following 5 key domains: comparability of participants, intervention, outcomes, statistical analysis, and funding or sponsorship. Of these 5 domains, comparability of participants is described as being of highest importance in the prevention of selection bias; funding or sponsorship is considered least important.

Inclusion and Exclusion Criteria

Hidden penis is anatomically defined by a lack of firm attachments of the skin and dartos fascia to the underlying Buck fascia.⁵ Patients with a diagnosis of hidden penis in accordance with this definition were considered comparable participants. Studies of adult patients classified as overweight or obese (body mass index >25) were included in the review.¹³

Studies that discussed iatrogenic (eg, circumcision complications, aesthetic genital surgery) or traumatic causes were excluded. Those that did not define diagnostic criteria for hidden penis were excluded to minimize the risk of definition bias.

Admissible Evidence and Critical Appraisal of Methodologic Quality

We examined all 234 abstracts of the studies identified in the initial search. The abstracts identified as being potentially relevant from the computer-based searches underwent full-text review (*Figure*).

The second stage in identifying the evidence most likely to influence our interrogation involved assessing the quality of published studies. By “quality” we mean that the study’s design, conduct, and analysis have minimized potential biases and have drawn honest conclusions based on the weight of the evidence. All studies selected from the search were appraised for their methodologic rigor using a common grading tool (*Table 1*).¹⁴ The assessments were performed independently by 2 reviewers: an osteopathic medical student (C.T.C.) and a co-investigator chosen for her scholarship in the area of urologic research (M.A.C.). Rating disagreements were resolved by consulting senior faculty (S.L.H.). The results of all reviewers’ evaluations were compiled into a bibliographic database.

Surgical Techniques

Of the studies that met our inclusion criteria, we compiled a list of the surgical techniques used and the number of patients who underwent those procedures. We also recorded the types of skin closure and coverage used to determine trends in treatment.

Results

The 7 eligible studies were assessed for the relief of symptoms, anatomic and functional improvement, and quality of study design. A total of 119 patients had undergone surgical intervention. *Table 2* presents specifications of each study. We believe that this set of parameters captured key outcomes that likely affected patient care.

Quality of the Evidence

We assessed the limitations in study design and the risk of bias across all studies (*Table 1*). The quality of evidence was downgraded according to explicit criteria for

the seriousness of the risk of bias and limitations in study design. One of the 7 studies provided a clear presentation of results and appropriate statistical analysis. Six studies were nonrandomized. Two studies lacked statistical analysis, 6 studies lacked a clear presentation of results, and 1 study lacked both measures of quality. Six studies appropriately accounted for individual-based differences, but 1 study failed to account for baseline differences. Four studies addressed follow-up. Three of these studies provided postoperative follow-up of 80% of the original sample. One of the 4 studies reporting postoperative penile length revealed a statistically significant difference.

All studies reported the use of specialized dressing materials or tissue sealant products. Despite the well-documented influence of manufacturer funding in clinical trials, only 3 reports disclosed any manufacturer relationship or provided a uniform declaration of conflict of interest. Although not inherently improper, a conflict of interest increases the risk of bias in research.

A lack of randomization introduces a high risk of bias. Definition bias occurred in 2 of the studies, whereby misdiagnosis affected the accuracy of observations.

We determined that the quality of the body of the evidence, categorized into 4 levels, was low in 4 studies, moderate in 2 studies, and high in 1 study.

Surgical Techniques

Among the 119 patients, 83 underwent penile release by cicatrixectomy or lysis of fascial adhesions. Eighty-five patients underwent suspensory ligament release, with 64 undergoing supplementary fundiform ligament release. Ninety-nine patients underwent suction lipectomy or panniculectomy. Additional techniques for penile release included z-plasty, abdominoplasty, escucheonectomy, and scrotoplasty.

Techniques for skin closure and coverage varied. In 65 patients, a local flap technique was used. In 5 of 10 patients receiving split-thickness skin grafts, fibrin glue was used to secure the closure. Primary skin closure was done in 8 patients and z-plasty in 5 patients. Closures were unspecified for 16 patients.

Discussion

Management of hidden penis takes place in a care continuum that includes (1) accurate anatomic diagnosis and risk assessment; (2) preoperative preparation, including concerted efforts to improve local hygiene and to manage intertrigo and balanitis; (3) panniculectomy when indicated; and (4) restoration of soft-tissue integrity. This research synthesis attempted to scrutinize the reported experiences of urologists who take on these complex cases.

Owing to the dearth of available and relevant studies on hidden penis in adults, this investigation provides little more than a starting point and, at most, the basis for a well-designed randomized trial. Methodologic limitations exist in much of the evidence base for the management of adult-onset hidden penis. Imprecision, lack of clarity, bias, and insufficient attention to confounding variables seem to be common on the basis of our findings. When interpreting observational studies, urologic surgeons should be mindful that they may be relying on methodologically poor research. The quality of clinical decisions and confidence in their outcomes will never be better than the quality of information supporting those decisions.

From the current review emerged a concern for the failure to account for baseline differences. That is, the patient selection process and indications were unrefined. In studies lacking a satisfactory description of individual baseline differences, confounders cannot be properly adjusted for, nor can associations with technique and results be tested for statistical significance. In addition, analyzing complex observational data based on naive cohort distinctions can result in biased estimates of the effect of surgical interventions.

It is implausible to improve the quality of urologic care without measuring patient outcomes. Complications such as penile deformity, paradoxical penile shortening, abnormal scarring, granuloma formation, sexual dysfunction, and psychological sequelae are important outcome measures in both early- and late-interval follow-up. However, among the study set, outcome measures were poorly defined and, with 1 exception, no long-term assessment of outcome was performed. Five of the 7

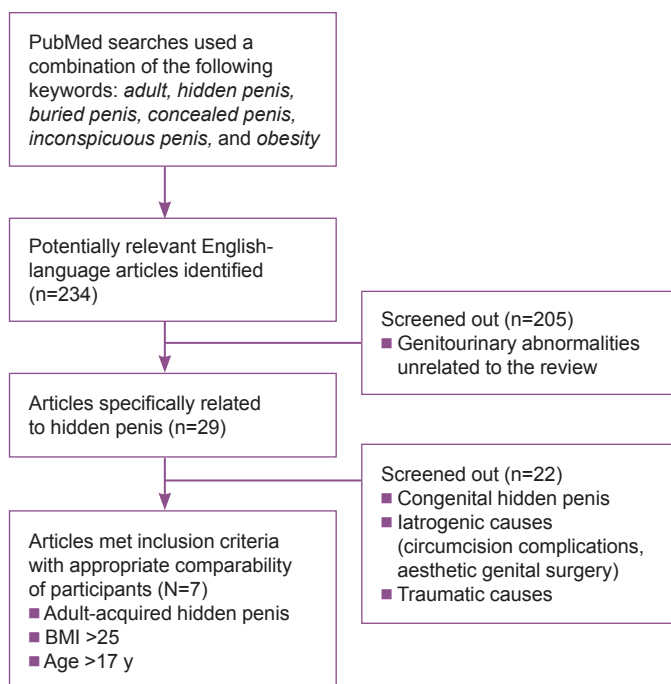


Figure.

Flow chart of the review process of studies on adult-acquired hidden penis.

Abbreviation: BMI, body mass index.

studies merely conveyed an overall satisfaction among all of their postoperative patients. One study¹⁶ alluded to rating outcomes using a scale published by pediatric urologists who reported, “Perfect cosmetic results were obtained and no serious complications developed.”

Imperfect as the literature is, however, the core processes of care entailed in the current treatment of patients with hidden penis can be epitomized.

Exteriorization and Ligament Release

Although a uniform surgical approach for penile exteriorization and ligament release is currently recommended in the urologic literature, the primary goal remains the same: to restore the original anatomy. Surgical principles and techniques have previously been proposed. According to Chopra et al,¹⁷ the 6 principles for successful hidden penis management include scar release, fat removal, reestablishment and shaping of the male-pattern escutcheon, reattachment of the median raphe to the pe-

Table 1.
ABCDE Grading Tool to Determine the Quality of Evidence for Each Study of Adult-Acquired Hidden Penis

Study	Quality of Evidence Grading Tool ^a					Total
	A	B	C	D	E	
Adham et al ²³	0	0	1	1	0	2
Donatucci et al ³	0	1	1	1	1	4
King et al ⁹	0	1	1	1	1	4
Shaeer and Shaeer ¹⁸	1	2	2	2	1	8
Tang et al ¹⁰	0	0	1	1	1	3
Connors et al ²⁴	0	0	1	1	0	2
Davies et al ²⁵	0	0	1	0	0	1

^a The quality of evidence grading tool was used to evaluate 5 aspects of each study from 2 to 0 points, with a total score at the end, as follows: A = Method of study group allocation (2, random; 1, quasi-random; and 0, selected concurrent controls). B = Data analysis and presentation of results (2, appropriate statistical analysis and clear presentation of results; 1, inappropriate statistical analysis or unclear presentation of results; and 0, inappropriate statistical analysis and unclear presentation of results). C = Presence of baseline differences between the groups that were potentially linked to study outcomes (of particular importance for observational studies) (2, no baseline differences present or appropriate statistical adjustments made for differences; 1, baseline differences present and no statistical adjustments made; and 0, baseline characteristics not reported). D = Objectivity of the outcome (2, objective outcomes or subjective outcomes with blinded assessment; 1, subjective outcomes with no blinding but clearly defined assessment criteria; and 0, subjective outcomes with no blinding and poorly defined). E = Completeness of follow-up for the appropriate unit of analysis (2, 90%; 1, 80-90%; and 0, <80% or not described). Total = 8-10, high (further research is very unlikely to change our confidence in the estimate of effect); 4-7, moderate (further research is likely to have an important impact on our confidence in the estimate of effect and may change the estimate); and <4, low (further research is very likely to have an important impact on our confidence in the estimate of effect and is likely to change the estimate).¹⁴

nile base, resurfacing of the denuded penis, and use of proper dressings for immobilization and splinting.

We agreed that the first step in hidden penis management is to assess the mobility of the penile skin. Mobilization of the penis may be achieved by complete release of the dartos tethering bands in a plane of dissection superficial to the Buck fascia. If insufficient release occurs, the dissection can include the suspensory ligament for further visibility.^{4,8,18} Fat removal is widely considered the next step in the procedure.^{8,9} Depending on the patient's habitus, either a panniculectomy or a suprapubic lipectomy is

performed to further improve penile exposure. After penile release and fat removal, the base of the penis is suspended from the pubic symphysis to prevent retraction by securing the tunica albuginea and dartos fascia to the rectus abdominus fascia with tacking sutures.^{3,7,8}

Reconstruction of Penile Skin Defects

With the exception of 1 study,²² notable deficiencies in penile skin were a consequence of the initial exteriorization procedure.^{3,9,10,18,24,25} Skin grafting to restore penile skin was performed in all cases of severe denudation of the shaft. Three of these 6 studies reported the application of split-thickness grafts to the penile shaft, and 3 reported the use of both thick split-thickness and full-thickness grafts.

Although skin grafting is a basic operation, the choice of split-thickness (0.0012-0.0015 inches), thick split-thickness (0.0016-0.0020 inches), or full split-thickness (about 0.039 inches) grafts is critical to the long-term success of the reconstruction. Thakar and Dugi¹⁹ elucidated the decision-making factors attendant to the choice of graft thickness—ie, anatomic and functional factors as well as disease process (necrotizing infection, trauma, burns, or cancer), ability of the penis to change size, and normal skin graft healing and adherence.¹⁹ The authors touted the benefits of thick split-thickness and full-thickness grafts for replacement of penile skin. Although split-thickness skin grafts are widely associated with improved adherence on recipient sites, full-thickness grafts from the groin have shown a greater than 94% survival, with minimal donor site morbidity.¹⁵ Thick grafts provide greater durability, minimize secondary contraction, reduce post-operative graft-penile shrinkage, and contain oil glands whose secretions lubricate the transplanted skin and reduce fissure occurrence.

Additional Considerations

Further considerations in the management of hidden penis include a multispecialty, preventive approach to the patient. Although surgery may be the only curative action, weight loss should be the initial goal in obese patients. Presurgical weight loss counseling for patients with

Table 2.
Study Characteristics for Each Study of Adult-Acquired Hidden Penis

Study	N	Comparability	Interventions	Outcome Measure	Statistical Analysis	Conflicts of Interest
Adham et al ²³	11	“Substantial weight gain”	Suction lipectomy; suspensory ligament release; abdominoplasty; anchoring of penile skin to rectus fascia	Summary statement of patient satisfaction	None	Absent
Donatucci et al ³	5	Morbid obesity	Scar excision and lysis of adhesions to dartos fascia; suspensory ligament release (prn); Z-plasty; anchoring dartos to pubis at penile base	Unvalidated pediatric self-report scale	None	Absent
King et al ⁹	5	Morbid obesity	Scar release; suspensory ligament release (prn); suprapubic lipectomy; penile fixation; split-thickness skin graft	Summary statement of patient satisfaction	None	Declared none
Shaeer ¹⁸ and Shaeer	64	Overweight	Scar release; suprapubic and lateral lipectomy; suspensory and fundiform anchoring penoscrotal/penopubic junctions; local flap, thick split, full-thickness skin graft	Significant objective statistical findings (pre/postoperative penile ligament release length), validated scale (IIEF)	<i>P</i> <.01	Declared none
Tang et al ¹⁰	5	Morbid obesity	Scrotoplasty; escutcheonectomy; split-thickness skin graft (fibrin glue)	Summary statement of patient satisfaction	None	Absent
Connors et al ²⁴	8	Obesity	Scar release; lipectomy/ panniculectomy; anchoring penile skin to pubis; primary skin closure when possible (otherwise, skin graft)	Analog scale for patient satisfaction	None	Declared none
Davies et al ²⁵	21	Obesity	Exterioration technique not specified; split-thickness skin graft; panniculectomy; variety of local flaps	Summary statement of patient satisfaction	None	Absent

Abbreviations: IIEF, International Index of Erectile Function; prn, as needed.

hidden penis is important considering the high prevalence of obesity associated with the condition. Although weight loss alone may not resolve all of the structural abnormalities, it is likely to improve outcomes by minimizing comorbidities and surgical complications.²⁰ Addressing long-term lifestyle changes in diet and physical activity may provide additional benefits. In addition, proper nutritional counseling could aid in the wound-healing process, as well as decrease the recovery time.²¹

Psychological health is another aspect to consider in patients with hidden penis. A predisposition to sexual dysfunction, depression, and low self-esteem is associated with

this condition.⁵ Postoperative personality changes can be dramatic as patients gain confidence and experience improved quality of life.⁵ Nevertheless, it is important that primary care physicians monitor these behavioral changes.

The collaboration of primary care physicians with urologists can enhance the overall treatment plan by using a patient-centered model to ensure continuity of care.²²

Conclusion

We failed to find ample support for the routine application of any single surgical protocol. In the absence of evidence

that would stand up to appropriate scientific scrutiny, none of the varied approaches can be broadly recommended. Were the body of evidence of moderate to high quality and the benefit-harm equilibrium balanced, an algorithmic strategy might be considered in individual cases. In our systematic review, this was not the case. Rigorous evaluative studies that assess the effectiveness of various surgical protocols aimed at exteriorizing hidden penis must properly precede their application as a standard of care.

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Author Contributions

All authors provided substantial contributions to conception and design, acquisition of data, or analysis and interpretation of data; drafted the article or revised it critically for important intellectual content; gave final approval of the version of the article to be published; and agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

References

- Keyes EL. Diseases of the Penis-Anatomy-Anomalies-Injuries-Inflammations. In: *Urology: Diseases of the Urinary Organs, Diseases of the Male Genital Organs, and the Venereal Diseases*. New York & London: D. Appleton and Company; 1917:640.
- Frenkl TL, Agarwal S, Caldamone AA. Results of a simplified technique for buried penis repair. *J Urol*. 2004;171(2 part 1):826-828.
- Donatucci CF, Ritter EF. Management of the buried penis in adults. *J Urol*. 1998;159(2):420-424.
- Crawford B. Buried penis. *Br J Plast Surg*. 1977;30(1):96-99.
- Maizels M, Zaontz M, Donovan J, Bushnick PN, Firlit CF. Surgical correction of the buried penis: description of a classification system and a technique to correct the disorder. *J Urol*. 1986;136(1 pt 2):268-271.
- Alter GJ, Ehrlich RM. A new technique for correction of the hidden penis in children and adults. *J Urol*. 1999;161(2):455-459.
- Zimmerman WB, Santucci RA. Treatment of adult-acquired buried penis. In: Spear M, ed. *Skin Grafts—Indications, Applications and Current Research*. 2011. <http://www.intechopen.com/books/skin-grafts-indications-applications-and-current-research/treatment-of-adult-acquired-buried-penis>. Accessed January 8, 2015.
- Pestana IA, Greenfield JM, Walsh M, Donatucci CF, Erdmann D. Management of "buried" penis in adulthood: an overview. *Plast Reconstr Surg*. 2009;124(4):1186-1195. doi:10.1097/PRS.0b013e3181b5a37f.
- King IC, Tahir A, Ramanathan C, Siddiqui H. Buried penis: evaluation of outcomes in children and adults, modification of a unified treatment algorithm, and review of the literature. *ISRN Urol*. 2013;109349. doi:10.1155/2013/109349.
- Tang S-H, Kamat D, Santucci RA. Modern management of adult-acquired buried penis. *Urology*. 2008;72(1):124-127. doi:10.1016/j.urology.2008.01.059.
- Sturm R, Hattori A. Morbid obesity rates continue to rise rapidly in the United States. *Int J Obes (Lond)*. 2012;37(6):889-891.
- U.S. Preventive Services Task Force ratings: strength of recommendations and quality of evidence. In: *Guide to Clinical Preventive Services*. 3rd ed. Rockville, MD: US Dept of Health and Human Services Agency for Healthcare Research and Quality; 2004.
- Organization WHO. *Obesity: Preventing and Managing the Global Epidemic: Report of a WHO Consultation on Obesity, Geneva, 3-5 June 1997*. Geneva, Switzerland: World Health Organization; 1998.
- Damiani G, Pinnarelli L, Sommella L, et al. Vacuum-assisted closure therapy for patients with infected sternal wounds: a meta-analysis of current evidence. *J Plast Reconstr Aesthet Surg*. 2011;64(9):1119-1123. doi:10.1016/j.bjps.2010.11.022.
- Kim S, Chung S-W, Cha IH. Full thickness skin grafts from the groin: donor site morbidity and graft survival rate from 50 cases. *J Korean Assoc Oral Maxillofac Surg*. 2013;39(1):21-26. doi:10.5125/jkaoms.2013.39.1.21.
- Boemers TM, De Jong TP. The surgical correction of buried penis: a new technique. *J Urol*. 1995;154(2 pt 1):550-552.
- Chopra CW, Ayoub NT, Bromfield C, Witt PD. Surgical management of acquired (cicatricial) buried penis in an adult patient. *Ann Plast Surg*. 2002;49(5):545-549.
- Shaer O, Shaer K. Revealing the buried penis in adults. *J Sex Med*. 2009;6(3):876-885. doi:10.1111/j.1743-6109.2008.01162.x.
- Thakar HJ, Dugi DD III. Skin grafting of the penis [review]. *Urol Clin North Am*. 2013;40(3):439-448. doi:10.1016/j.ucl.2013.04.004.
- Anaya DA, Dellinger EP. The obese surgical patient: a susceptible host for infection. *Surg Infect (Larchmt)*. 2006;7(5):473-480.
- Guo S, DiPietro LA. Factors affecting wound healing. *J Dent Res*. 2010;89(3):219-229. doi:10.1177/0022034509359125.
- Donini LM, Savina C, Castellana E, et al. Multidisciplinary approach to obesity. *Eat Weight Disord*. 2009;14(1):23-32.
- Adham MN, Teimourian B, Mosca P. Buried penis release in adults with suction lipectomy and abdominoplasty. *Plast Reconstr Surg*. 2000;106(4):840-844.
- Conners WP III, Erdmann D, Donatucci CF. Outcomes and restoration of sexual function in adult patients with buried penis. *J Urol*. 2009;181(4 suppl):S447-S448.
- Davies TO, Gur U, McCammon KA, Schlossberg SM, Gilbert DR, Jordan GH. Buried penis in adults. *J Urol*. 2008;179(4):10.