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QUESTION 5: Is routine urinary screening indicated prior to elective total joint arthroplasty (TJA)? If so, how should asymptomatic bacteriuria be treated prior to undergoing elective joint arthroplasty?

RECOMMENDATION: No. Routine urinary screening in asymptomatic patients is not recommended prior to elective TJA. There is also no evidence to demonstrate that preoperative treatment of asymptomatic bacteriuria is of any benefit.

LEVEL OF EVIDENCE: Moderate

DELEGATE VOTE: Agree: 89%, Disagree: 9%, Abstain: 2% (Super Majority, Strong Consensus)

RATIONALE

Concern with the genitourinary tract as a possible source of hematogenous seeding of bacteria into the joint has been present from as far back as the 1970s, when a few case reports [1–3] and a retrospective study [4] found a correlation between patients with periprosthetic joint infections (PJIs) and perioperative urinary tract infections (UTIs).

Presently, there seems to be extensive evidence supporting a definitive relation between perioperative symptomatic UTI and an increased risk of PJIs [5–16]. Consequently, it is widely accepted not only that treatment should be instituted, but also that surgery should be postponed in such a clinical scenario. Nevertheless, even this claim is not without dispute, as some reports do not corroborate this finding [17–20]. This data should not, however, be blindly extrapolated into conditions such as asymptomatic bacteriuria (ASB), as they are clearly two very different clinical scenarios.

Urinalysis is frequently used as a screening test to diagnose UTI in asymptomatic patients and a positive urine abnormality is often misinterpreted as definitive proof that the patient has a UTI [21]. A few studies focusing on screening asymptomatic patients with urinalysis were analyzed. All of them suggest that there is no relation between urine abnormalities and an increased risk of developing a PJI [22–25].

Urine cultures, regardless of urinalysis, are still the gold standard test for identifying UTIs in symptomatic patients and are perhaps the most reliable way to identify bacteriuria in asymptomatic patients. A systematic review of the literature was performed, confirming that ASB is a common finding in elective total joint arthroplasty candidates ranging from 5 to 19% [23,25–29]. This prevalence is also in agreement with previous descriptions of the prevalence of asymptomatic bacteriuria in similar age groups of the general population [30,31].

Results regarding a possible association between ASB and PJIs are scarce and conflicting (see Table 1). A large (around 2,500 patients) multicenter study by Sousa et al. [29] has found a statistically significant higher risk of PJI in ASB patients [29]. A similar more recent study, conducted within the UK National Health System and using the same definition for asymptomatic bacteriuria, found the same statistical association [23]. Among the 5,542 patients included, 1,174 (21.2%) did not have a preoperative urine culture taken. A total of 4,368 (78.8%) had a preoperative urine culture taken within a year before the date of surgery, of which 140 (3.2%) had preoperative ASB. The infection rate in the ASB group was 5% (7/140), which was significantly higher than the 0.61% (26/4228) in the non-ASB group and the 1.96% (23/1174) in the group without a screening urine sample ($p < 0.001$). Although the difference was not statistically significant, they also found that the ASB group had a higher proportion of PJIs due to gram-negative bacteria despite all patients receiving preoperative treatment. Nevertheless, the ASB isolate was the same microorganism as the PJI isolate in only one of the seven cases.

Ollivere et al. [32] also studied the impact of asymptomatic urinary tract colonization in elective orthopaedic surgery, although they focused on outcomes other than PJI specifically. They found that 38% (15/39) of patients with preoperative ASB showed some form of postoperative delayed wound healing or confirmed superficial wound infection compared to 16% (83/511) of patients in the other subgroup, leading to a significantly increased relative risk of wound complications [32]. On the other hand, a recent study by Honkanen et al. [27] with over 20,000 patients [27] and several other smaller series [23,25,26,28,33] did not find an increased risk. One possible explanation for this potential statistical association is that ASB is not a risk factor in itself, but rather a marker for some kind of increased susceptibility [29,34].

What seems to be clear in interpreting all of the results of this systematic review is the lack of a clear causal relation. The overwhelming majority of PJI isolates are distinct from those previously found in the urine of asymptomatic total joint arthroplasty candidates [23,25–29,33]. This finding helps to understand the other clear result that ASB antibiotic therapy does not influence postoperative PJI risk [23,25–29,33]. Treating ASB not only seems not to influence PJI risk, but it also does not seem to prevent symptomatic UTI [22,35] from occurring after surgery (which might be a secondary benefit).

Following the current trend to recommend against treatment of asymptomatic bacteriuria except in cases of proven benefit, [36] the authors of this review believe that there is no place for urinary screening and treatment of asymptomatic bacteriuria before total joint arthroplasty. In addition, urinary abnormalities in asymptomatic patients should not be regarded as an indication to delay surgery. In fact, recent evidence seems to corroborate the lack of clinical utility of routinely screening urine in asymptomatic patients prior to elective total joint arthroplasty. Bailin et al. [37] performed a before-and-after study to analyze the impact of a new protocol for managing asymptomatic urinalysis abnormalities that aimed to reduce antibiotic prescriptions. After the new protocol was implemented, there was a significant decrease in antimicrobial prescriptions based on urine abnormalities both preoperatively and postoperatively. Notwithstanding, PJI rates after total joint arthroplasty neither increased in the immediate post intervention period nor in the ensuing years [37]. Lamb et al. [38] implemented an institutional policy to no longer routinely process urine specimens submitted from orthopaedic preoperative clinics. They performed a time-series analysis to evaluate the impact of this change on the incidence of PJIs. In the study period before policy change, 3,069 patients were screened of whom 352 (11.5%) had positive urine cultures and 43 of 352 (12.2%) received perioperative antibiotic treatment. Following the intervention, there were no further perioperative antibiotic courses for preoperative ASB. The periprosthetic joint infection rate was 0.03% (1 of 3,523) during the baseline period and did not change significantly during the intervention period 0.2% (3 of 1,891). None of the PJIs during the intervention period were caused by urinary pathogens [38]. Nevertheless, it is recommended that if a patient has irritating symptoms, screening tests such as urine dip sticks, white blood cell counts, and urine cultures should be considered.

TABLE 1. Summary of asymptomatic bacteriuria and prosthetic joint infection rates major reports

Author, Year	Number of Joint Arthroplasties	Definition of Asymptomatic Bacteriuria	Patients without ASB		Patients with ASB		Follow-up	Major Finding(s)
			Number	Infection (%)	Number	Infection (%)		
Glynn 1984 [26]	299	Midstream urine specimens with significant bacterial growth (> 100,000)	242	0 (0.0)	57	2 (3.5)	3 months	- In all, 39 of 57 patients were operated on without antibiotic therapy; - Both surgical wound infections grew *Staphylococcus pyogenes* with previous *Escherichia coli* in urine isolate
Ritter 1987 [28]	364	Clean catch urine specimens with colony counts > 100,000	329	2 (0.6)	35	1 (2.9)	Up to 5 years	- All infected cases grew staphylococci including the patient that grew *Escherichia coli* in preoperative urine culture
Cordero-Ampuero 2013 [23]	471	> 100,000 colony-forming units *(only 181/471 patients with abnormal urinalysis proceeded with cultures)*	425	12 (2.8)	46	1 (2.2)		- 26 of the 46 ASB patients received specific antibiotic treatment for 7 days that began the operation day - in no case were the bacteria found in the joint the same as those in corresponding preoperative urine cultures
Sousa 2014 [29]	2, 497	Isolation ≥ 10^5 colony-forming units/mL in the absence of signs or symptoms of UTI	2,193	30 (1.4)	303	13 (4.3)	12 months	- PJI rate was significantly higher in the ASB group (OR: 3.23) although surgical isolates did not correlate to urine isolates; - Preoperative ASB treatment did not influence PJI rate – 3.9% (6/154) among treated vs. 4.7% (7/149) among untreated patients
Martínez-Vélez 2016 [25]	215	> 100,000 colony-forming units *(only 89/215 patients with abnormal urinalysis proceeded with cultures)*	204	0 (0.0)	11	1 (9.1)	>48 months	- Four of the 11 ASB patients received specific antibiotic treatment for 7 days that began the operation day - Infected case grew *Staphylococcus epidermidis* which differed from corresponding preoperative urine culture
Garcia-Nuño 2017 [33]	148	Isolation ≥ 10^5 colony-forming units/mL in the absence of signs or symptoms of UTI	121	2 (1.6)	27	2 (7.4)	N/R	- ASB was significantly more common in patients with dementia - There was one case in which the microorganism isolated intraoperatively

Author, Year	Number of Joint Arthroplasties	Definition of Asymptomatic Bacteriuria	Patients without ASB		Patients with ASB		Follow-up	Major Finding(s)
			Number	Infection (%)	Number	Infection (%)		
								coincided with the urine isolate *(P. aeruginosa)*
Honkanen 2018 [27]	20,226	All bacterial growth in the urine was considered significant	18, 848	133 (0.71)	1,378	7 (0.51)	12 months	- No statistically significant association was found between positive preoperative urine culture and PJI
Weale 2018 [39]	4,368	Isolation ≥ 10^5 colony-forming units/mL in the absence of signs or symptoms of UTI	4, 228	26 (0.61)	140	7 (5.0)	< 0.001	Up to 24 months
TOTAL	**28,588**		26,591	205 (0.8)	1,997	34 (1.7)	< 0.0001	

ASB, asymptomatic bacteriuria; UTI, urinary tract infection; OR, odds ratio

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