

Sports



Prevention



infectionconsensus2018@gmail.com

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- The same comments can be posted on the contact page of our website

lcmphilly.com



Question Sport-1 (former Sport-17) What perioperative antibiotic prophylaxis should be used in patients undergoing arthroscopic surgery without the use of implants or grafts? What about patients with penicillin allergy?

RESEARCHED BY:



Raul García-Bógalo MD, Spain



Sachin Tapasvi MD, India



Literature:

*** Meta-analysis 0, Prospective/Randomized 2, Retrospective 19**

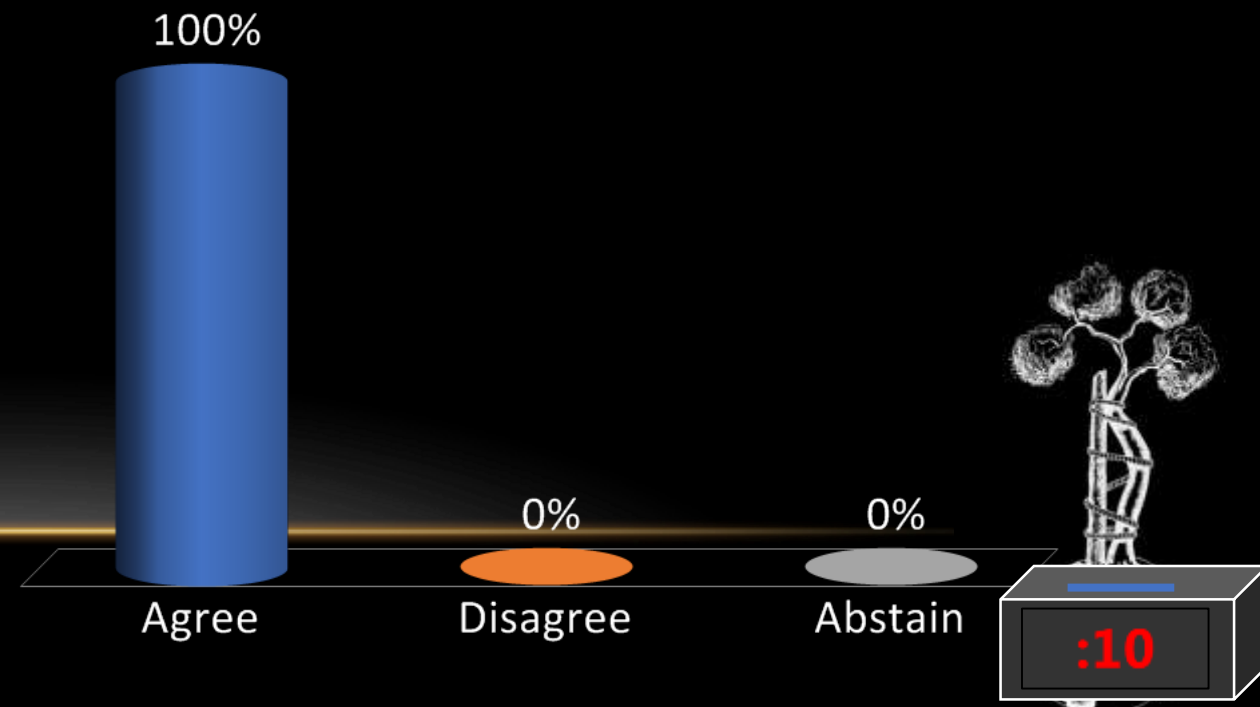
*** No significant benefit of antibiotic prophylaxis with respect to postoperative infection rates following routine knee arthroscopy, without implants/grafts, in 2 RCTs (Qi et al and Wieck et al)**



Recommendation: The literature neither supports nor refutes the use of antibiotic prophylaxis for routine arthroscopic surgeries, without the use of implants or grafts. For non-compromised non-implant arthroscopy antibiotic prophylaxis is not required. Patients with comorbidities which have been shown to be at higher risk for infection may benefit from antibiotic prophylaxis. A first generation (cefazolin) or a second generation (cefuroxime) cephalosporin can be used as first line, including for those with a non-anaphylactic penicillin allergy. For patients with an anaphylactic penicillin allergy, other antibiotics such as vancomycin, clindamycin or teicoplanin can be used.

Level of Evidence: Consensus

- A. Agree
- B. Disagree
- C. Abstain



Question Sport-2 (former Sport-9) Should routine Methicillin Resistant Staphylococcus aureus (MRSA) screening be in place for patients undergoing elective sports procedures?

RESEARCHED BY:



Nirav K Patel MD, USA



Andy O Miller MD, USA



Literature:

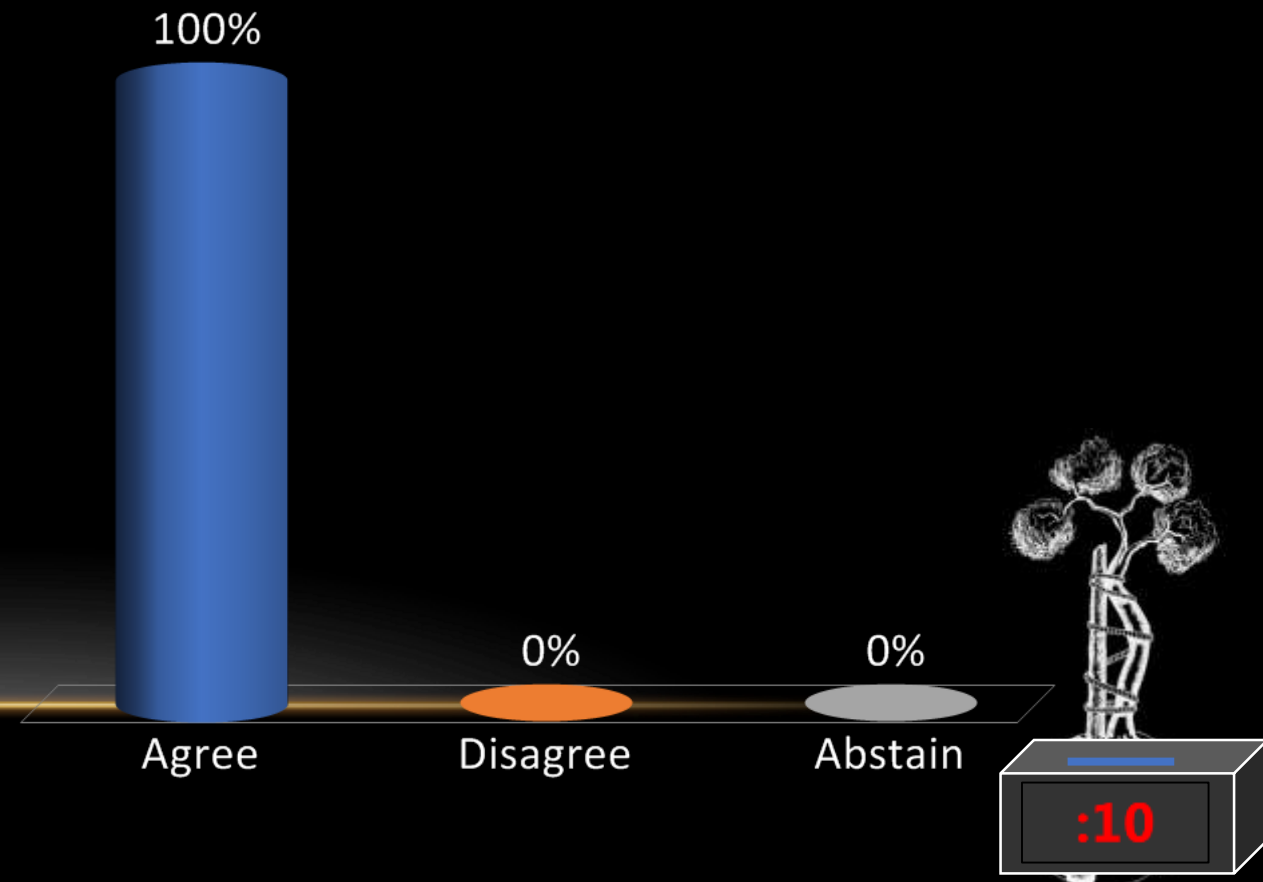
- * **Meta-analysis 0, Prospective/Randomized 0, Retrospective 11**
- * **Majority of MRSA screening related literature is outside setting of elective sports study**
- * **A single study (Kim et al) evaluated patients undergoing orthopedic procedures, including those receiving sports procedures. They screened 7019 of 7338 patients preoperative for MRSA. Of these, 309 (4.4%) were MRSA carriers and these patients had a significantly higher risk of SSI vs. non-MRSA carriers (0.97% vs 0.14%; $p=0.02$).**



Recommendation: Routine Methicillin Resistant Staphylococcus aureus (MRSA) screening is not warranted for patients undergoing elective sports procedures. Screening may be appropriate in higher risk patients and those patients undergoing more complex procedures.

Level of Evidence: Consensus

- A. Agree
- B. Disagree
- C. Abstain



Question Sport-3 (former Sport-16) What perioperative antibiotic prophylaxis should be used in patients undergoing arthroscopic surgery who are Methicillin resistant *Staphylococcus aureus* (MRSA) carriers?

RESEARCHED BY:



Jacek Kruczyński MD, Poland



António Nogueira de Sousa MD, Portugal



Literature:

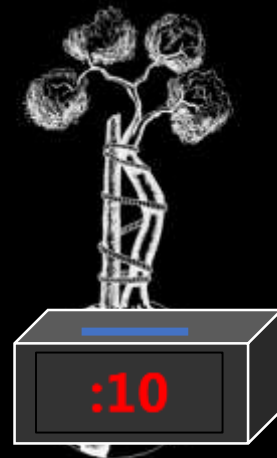
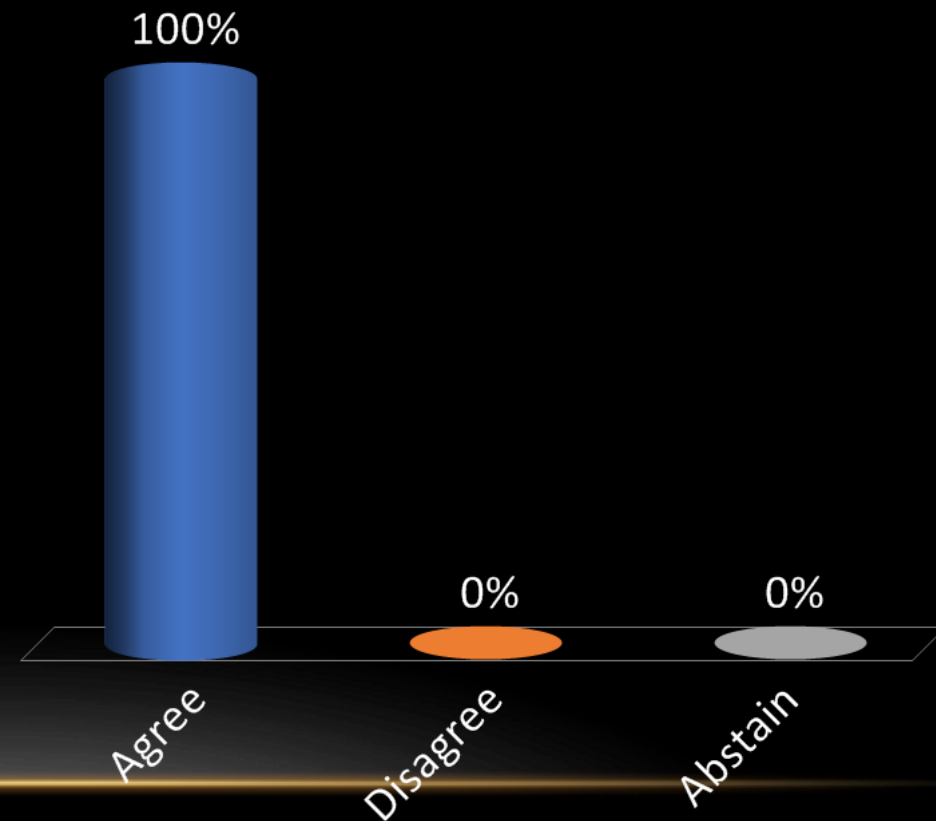
- * Meta-analysis 0, Prospective/Randomized 0, Retrospective 17
- * American Academy of Orthopaedic Surgeons (AAOS) and Surgical Care Improvement Project (SCIP) recommend first or second-generation cephalosporins as the prophylactic antibiotics of choice for patients who are not colonized with MRSA, with vancomycin prophylaxis reserved for those who are MRSA colonized.
- * Addition of vancomycin or an aminoglycoside to the prophylactic perioperative antibiotic regimen results in a predicted activity of 83% to 97% against the most common pathogens causing surgical site infections (Berríos-Torres et al).



Recommendation: Methicillin resistant *Staphylococcus aureus* (MRSA) carriers should be administered vancomycin or teicoplanin as antibiotic prophylaxis prior to arthroscopic surgery involving an implant and/or a graft or for patients at higher risk of infection.

Level of Evidence: Consensus

- A. Agree
- B. Disagree
- C. Abstain



Question Sport-4 (former Sport-13) What is the best method for allograft sterilization that minimizes the incidence of postoperative infections and mechanical weakening of the graft?

RESEARCHED BY:



Sam Oussedik MD, UK



Sachin Tapasvi MD, India



Literature:

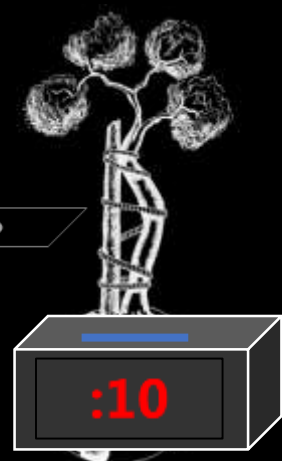
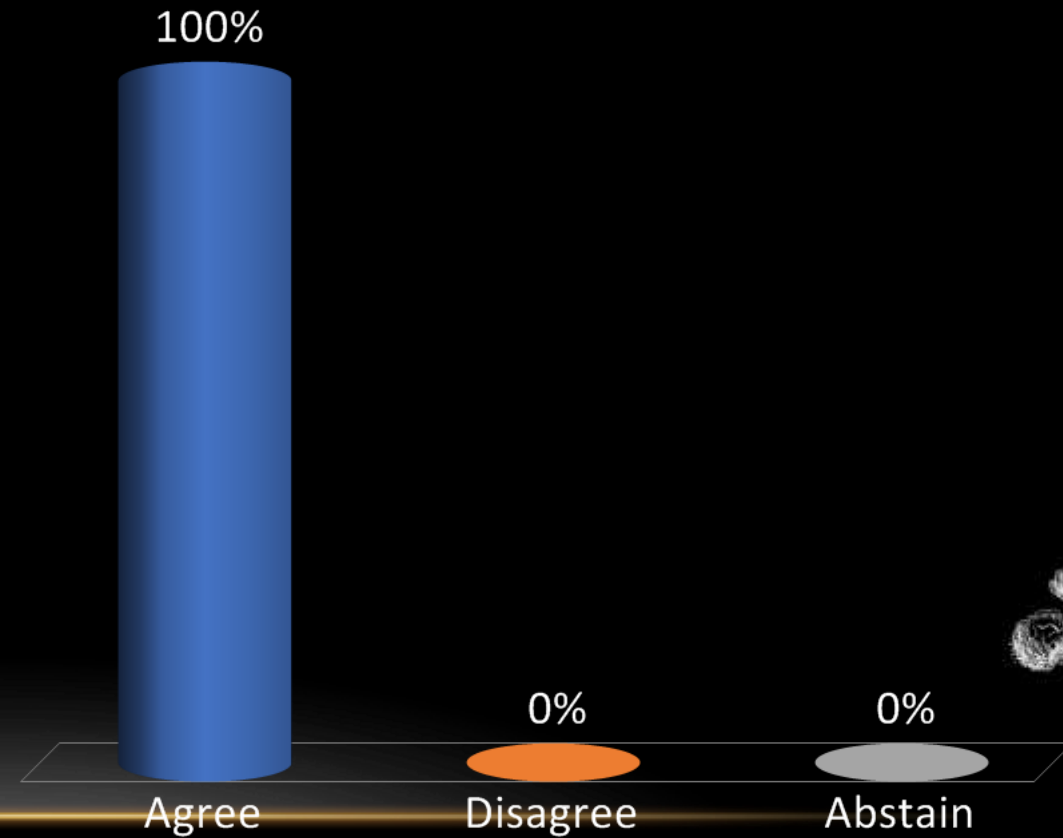
- * **Meta-analysis 0, Prospective/Randomized 0, Retrospective 39**
- * **Several sterilization techniques, which can be split into irradiation and chemical sterilization.**
- * **Literature suggests no consensus about the fact that a low dose of radiation does not damage the graft.**
- * **Park et al. reviewed 21 publications and found a total of 1,453 ACLR with allograft (415 low-dose irradiated; 1038 non-irradiated). The authors found worse functional outcomes and greater rates of re-rupture in patients receiving irradiated allograft.**
- * **However, on examination of other publications, the result was good-excellent in both groups and not all of the functional scores favored the non-irradiated group as the IKDC was higher in irradiated group.**
- * **Several publications suggest that a low dose of gamma radiation does not affect the bio-mechanical properties of the graft, although other studies find the opposite.**



Recommendation: The best method for ACL allograft sterilization that minimizes the incidence of postoperative infection and mechanical weakening of the graft is the use of irradiation (preferably less than 1.8 Mrad). Allografts should be harvested aseptically and fresh frozen, whenever possible.

Level of Evidence: Limited

- A. Agree
- B. Disagree
- C. Abstain



Question Sport-5 (former Sport-7) Should autograft or allograft be soaked in an antiseptic or antibiotic solution prior to implantation during ACL reconstruction?

RESEARCHED BY:



Jacek Kruczyński MD, Poland



Christopher Dodson MD, USA



Literature:

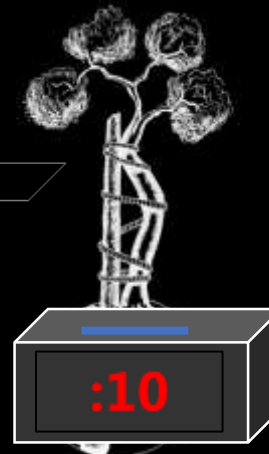
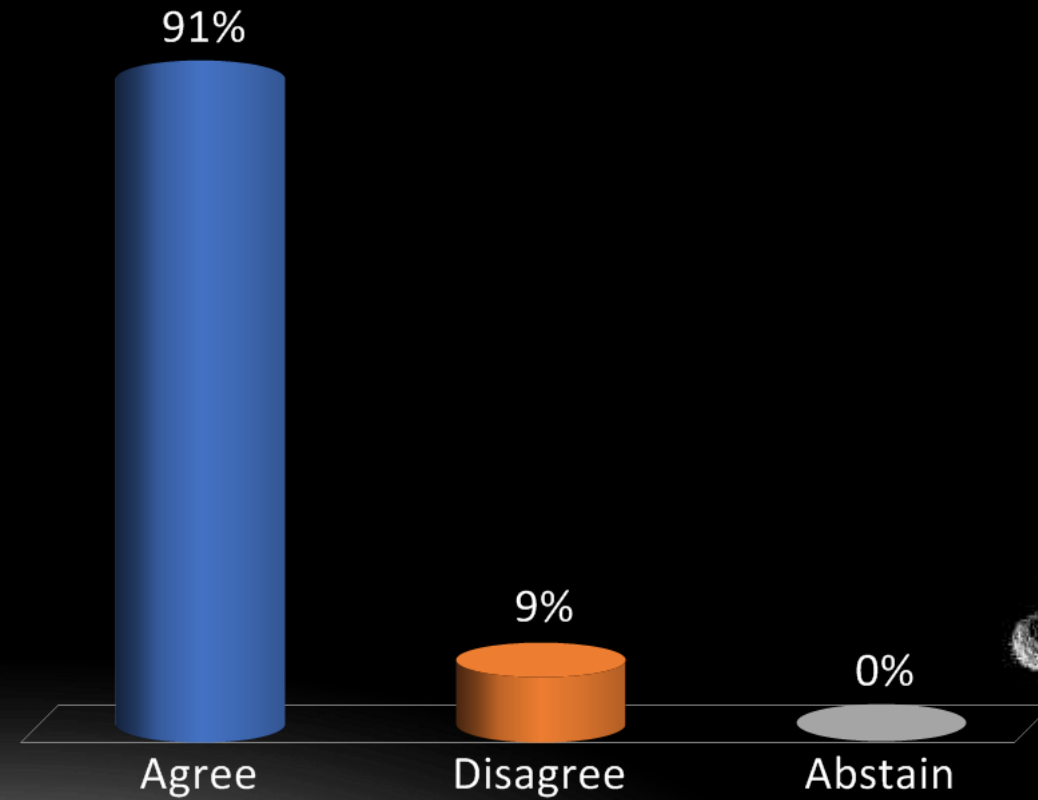
- * **Meta-analysis 1, Prospective/Randomized 0, Retrospective 12**
- * **Strong evidences that pre-soaking of hamstrings grafts in topical vancomycin reduced the rate of post-operative infection when compared to IV antibiotics alone.**
- * **Vertullo et al noted statistically significant difference in infection rates was between the two patient groups – one group receiving preoperative IV antibiotics only versus the group with the vancomycin soaked allograft (1.4% vs. 0% rate)**
- * **Similarly, Pérez-Prieto et al. found the group without vancomycin soaking of the graft had an infection rate of 1.85% while the group of patients who received systemic antibiotic prophylaxis and graft presoaking with vancomycin did not experience any infections (0%)**



Recommendation: Yes, autograft tissue should be soaked in an antibiotic solution prior to implantation during ACL reconstruction.

Level of Evidence: Moderate

- A. Agree
- B. Disagree
- C. Abstain



Question Sport-6 (former Sport-14) What is the most appropriate/effective sterilization method of an ACL autograft dropped on the operating room floor during ACL reconstruction? Should the tissue instead be disposed and alternate graft source acquired?

RESEARCHED BY:



Carl Haasper MD, Germany



Sommer Hammoud MD, USA



Literature:

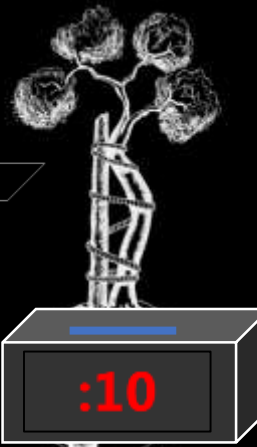
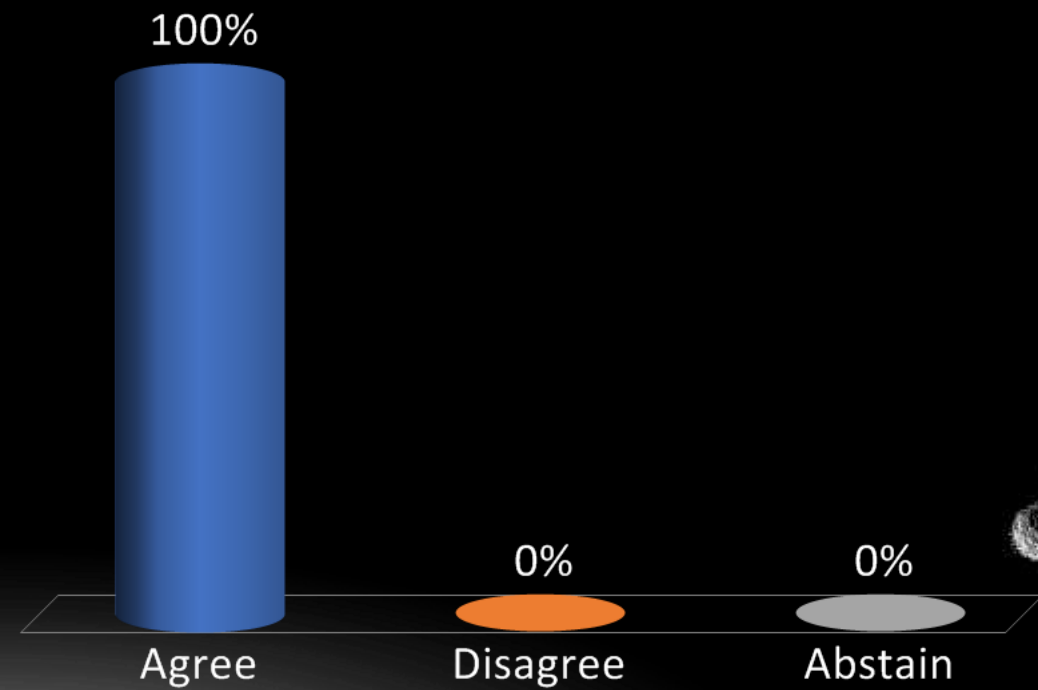
- * Systematic review 1, Prospective/Randomized 1, Retrospective 12**
- * A systematic review of 10 studies (Khan et al) reported that rinsing the contaminated graft in a 4% chlorhexidine solution was the most effective method of ACL graft decontamination, in the event that an ACL graft is dropped on the operative room floor.**



Recommendation: Rinsing the contaminated graft in a 4% solution of chlorhexidine gluconate is the most effective decontamination method in the event that an ACL graft is dropped on the operating room floor. When a chlorhexidine gluconate solution is used for decontamination of the dropped ACL graft, the subsequent rates of infection are very low, suggesting that there is no need to dispose of the ACL graft.

Level of Evidence: Moderate

- A. Agree
- B. Disagree
- C. Abstain



Question Sport-7 (former Sport-2) Does the use of a tourniquet influence the incidence of surgical site infection (SSI) following arthroscopic surgery of extremity joints?

RESEARCHED BY:



Matteo Romagnoli MD, Italy



Sandro Kohl MD, Switzerland



Literature:

*** Meta-analysis 2, Prospective/Randomized 1, Retrospective 15**

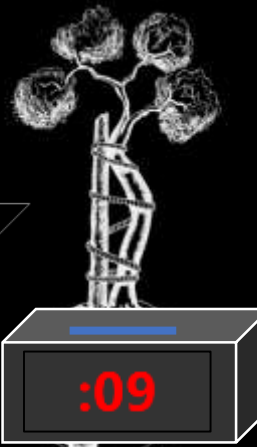
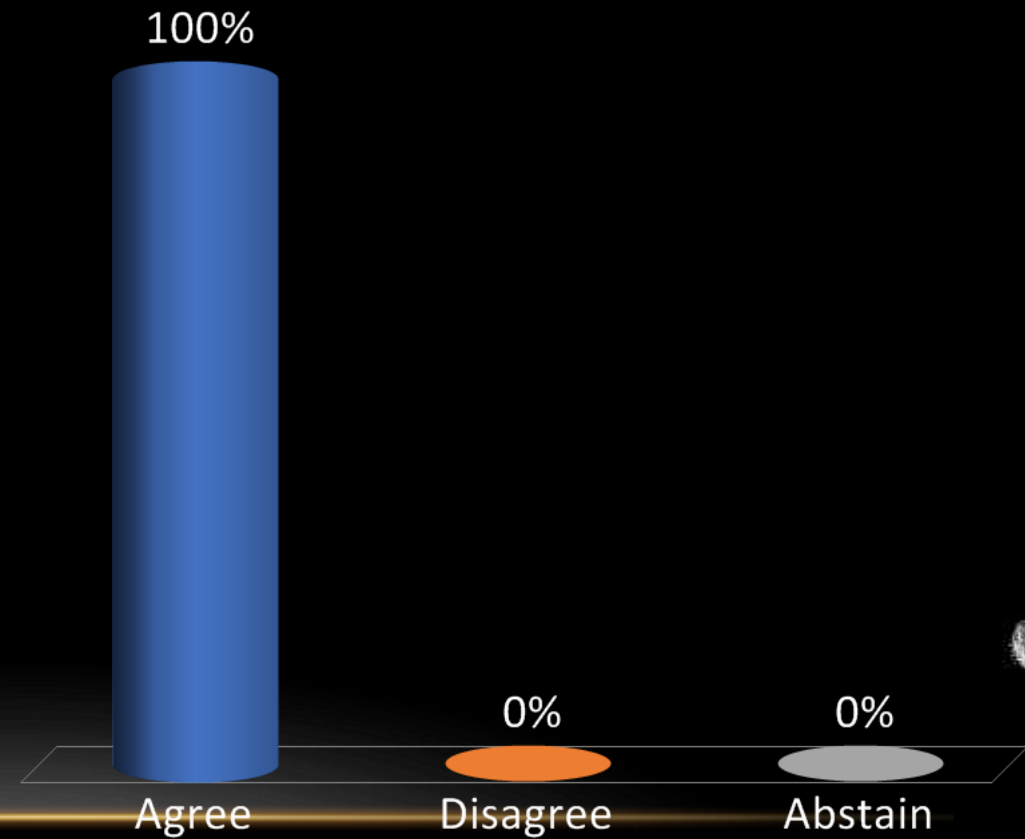
***Two meta-analyses found no benefit in using or not using the tourniquet, in terms of functional outcomes and general complications (Kuo LT et al; Smith TO et al)**



Recommendation: No. A direct relationship between use of tourniquet for arthroscopic surgery of the extremity joints and the incidence of SSI has not been established.

Level of Evidence: Moderate

- A. Agree
- B. Disagree
- C. Abstain



Question Sport-8 (former Sport-18) What strategies should be employed to minimize recurrent infection of a previously infected joint during subsequent joint reconstructive (non-arthroplasty) procedures?

RESEARCHED BY:



Ramón Barredo MD, Ecuador



Roberto Rossi MD, Italy



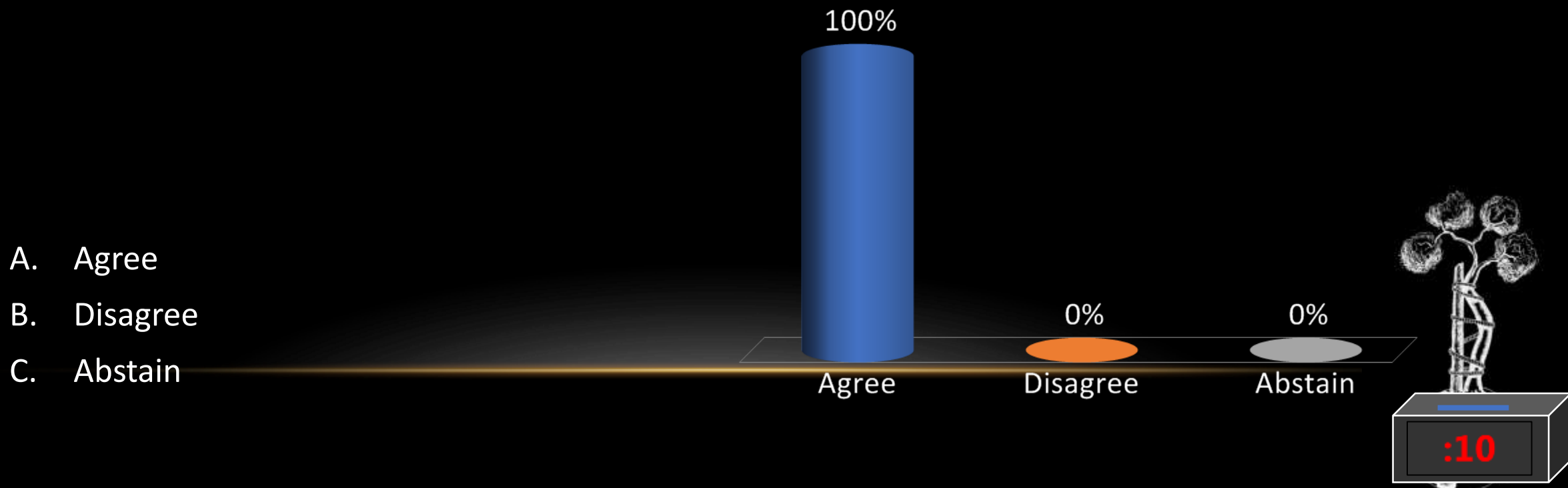
Literature:

- * **Meta-analysis 0, Prospective/Randomized 1, Retrospective 24**
- * **No studies specifically focusing on prevention of recurrent infection in previously infected joint during reconstructive (non-arthroplasty) procedures.**
- * **Multiple studies describe the risk factors for developing septic arthritis, such as morbid obesity, tobacco use, inflammatory arthritis, chronic kidney disease, diabetes and hemodialysis .**



Recommendation: We recommend that joints with remote or recent history of infection, be aspirated and the synovial fluid analyzed for the presence of infection. The affected joint should not exhibit any clinical signs of infection such as erythema, swelling, warmth and others at the time of planned reconstruction.

Level of Evidence: Limited



Question Sport-9 (former Sport-5) Is the surgical management of a patient with infection following ACL reconstruction an emergency or can the patient be optimized prior to surgical intervention? If so, what needs to be optimized?

RESEARCHED BY:



Dragan Radoičić MD, Serbia



Ramón Barredo MD, Ecuador



Literature:

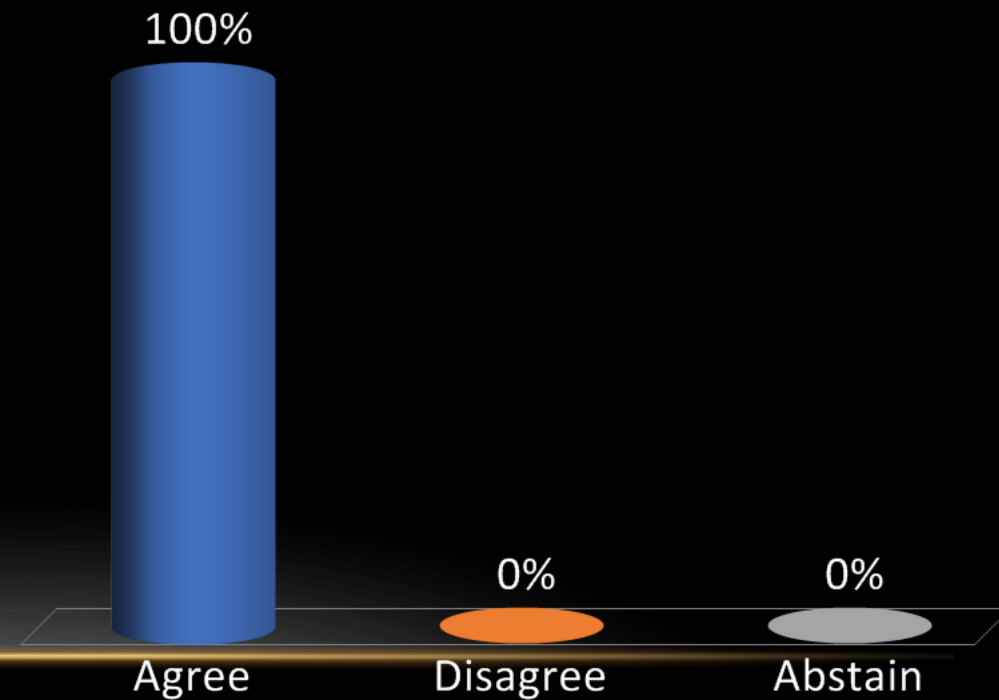
- * **Meta-analysis 2, Prospective/Randomized 1, Retrospective 24**
- * **Most studies published on infection following ACLR have been retrospective reviews. It is well-established in these studies that infection following ACL reconstruction can rarely be a life-threatening emergency.**
- * **Nonetheless, timely and well-planned course of action based on clinical, laboratory data and microbiological findings is recommended.**
- * **Graft retention has been shown as a goal along with articular cartilage protection, so lengthy delays should be avoided.**



Recommendation: Infection following anterior cruciate ligament reconstruction (ACLR) is not a surgical emergency in most cases. Sepsis associated with infected ACL requires an emergency treatment. Most surgeons agree surgical intervention should take place without delay, on a prompt basis, preferably on the same day as the clinical presentation of an ACLR infection. The patient's condition needs to be optimized prior to surgery.

Level of Evidence: Moderate

- A. Agree
- B. Disagree
- C. Abstain



Diagnostic



Question Sport-10 (former Sport-8) Should culture samples be taken during arthroscopic treatment of a knee joint infection? If so, how many and from which area in the joint?

RESEARCHED BY:



Arnaldo Hernandez MD, Brazil



Roberto Rossi MD, Italy



Literature:

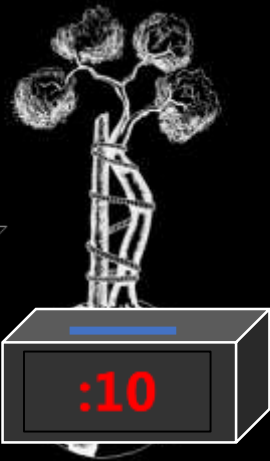
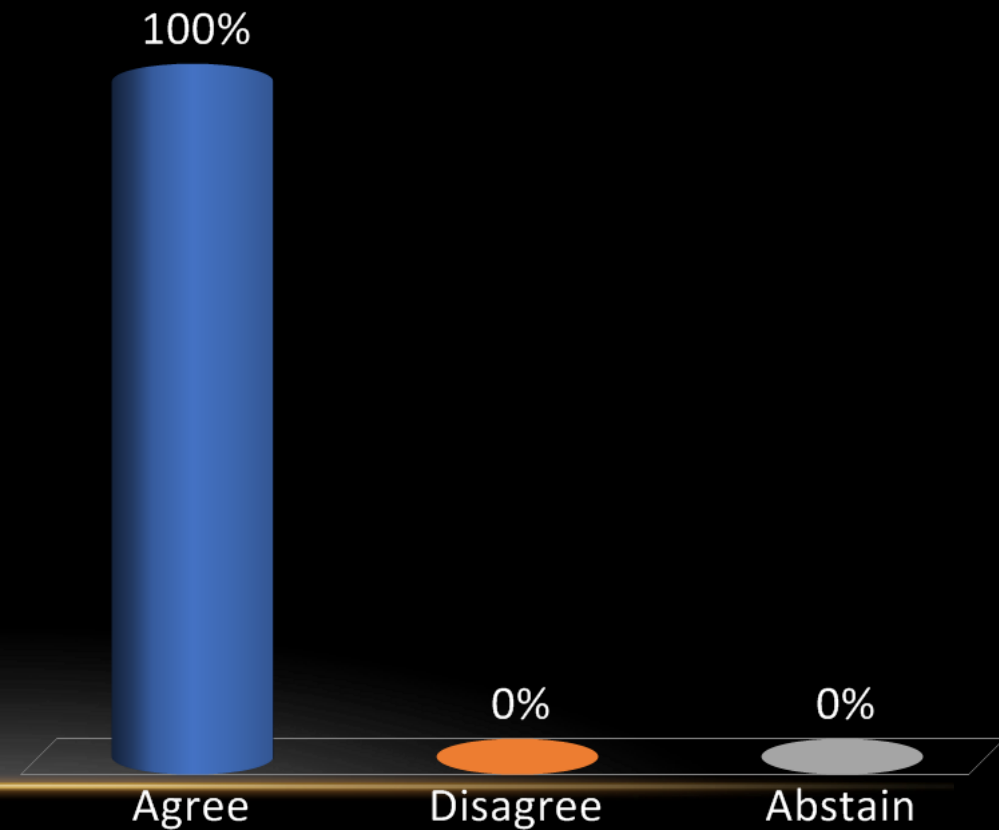
- * **Meta-analysis 1, Prospective/Randomized 2, Retrospective 38**
- * **Gandhi et al. in their study on 113 PJI, concluded that the optimal number of cultures needed to obtain a positive test result was 4. Furthermore, they stated that increasing the number of samples increases specificity but reduces sensitivity.**
- * **Three to five samples were recommended at the previous ICM in 2013 and this has been corroborated in the published literature (Parvizi et al; Della Valle et al)**



Recommendation: Yes, culture samples should be taken during arthroscopic treatment of a knee joint infection. We recommend that at least three culture samples from different sites be taken.

Level of Evidence: Low to Moderate

- A. Agree
- B. Disagree
- C. Abstain



Question Sport-11 (former Sport-12) What diagnostic "algorithm" should be used to diagnose infection following ACL reconstruction?

RESEARCHED BY:



Sam Oussedik MD, UK



Kevin Plancher MD, USA



Literature:

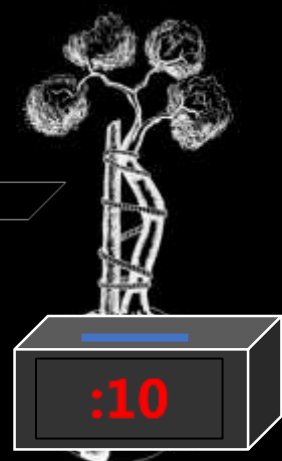
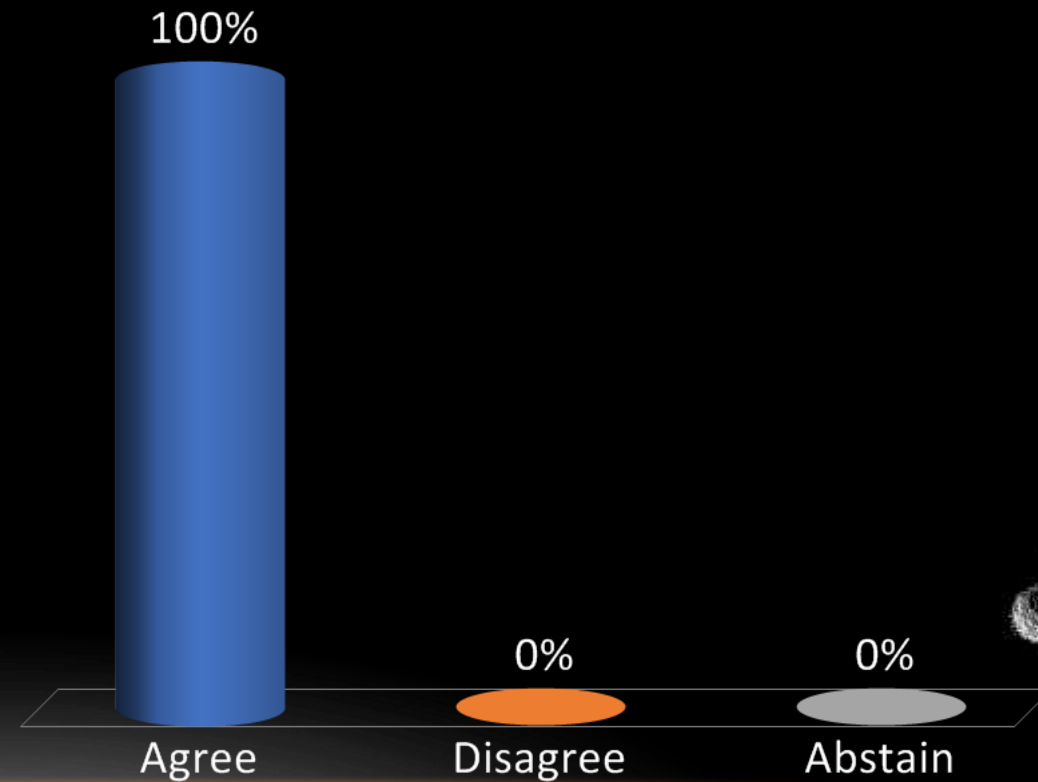
- * **Meta-analysis 0, Prospective/Randomized 0, Retrospective 24**
- * **Features of the clinical presentation that raise suspicion of infection include; fever, malaise, sudden change in knee pain of moderate intensity, local incision drainage, local warmth, local swelling, erythema, decreased knee range of motion, and inguinal lymph node enlargement, though each of these symptoms is not present in all cases.**
- * **Multiple studies suggest the utility of serum laboratory tests such as CRP and in the diagnostic algorithm, as well as synovial fluid analysis**



Recommendation: The “algorithm” to diagnose postoperative infection in patients with ACL reconstruction should include clinical presentation, serological tests including C-reactive protein and erythrocyte sedimentation rate, and analysis of the synovial fluid aspirate including gram staining and culture.

Level of Evidence: Moderate

- A. Agree
- B. Disagree
- C. Abstain



Treatment



Question Sport-12 (former Sport-1) Can arthroscopy be used for management of patients with acute sepsis of the native knee joint?

RESEARCHED BY:



Robert van der Wal MD, Netherlands



James Murray MD, UK



Literature:

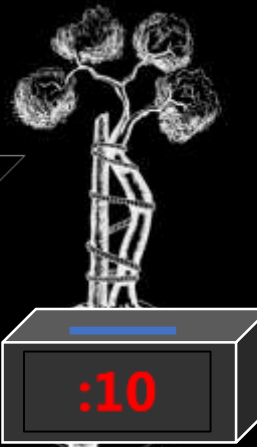
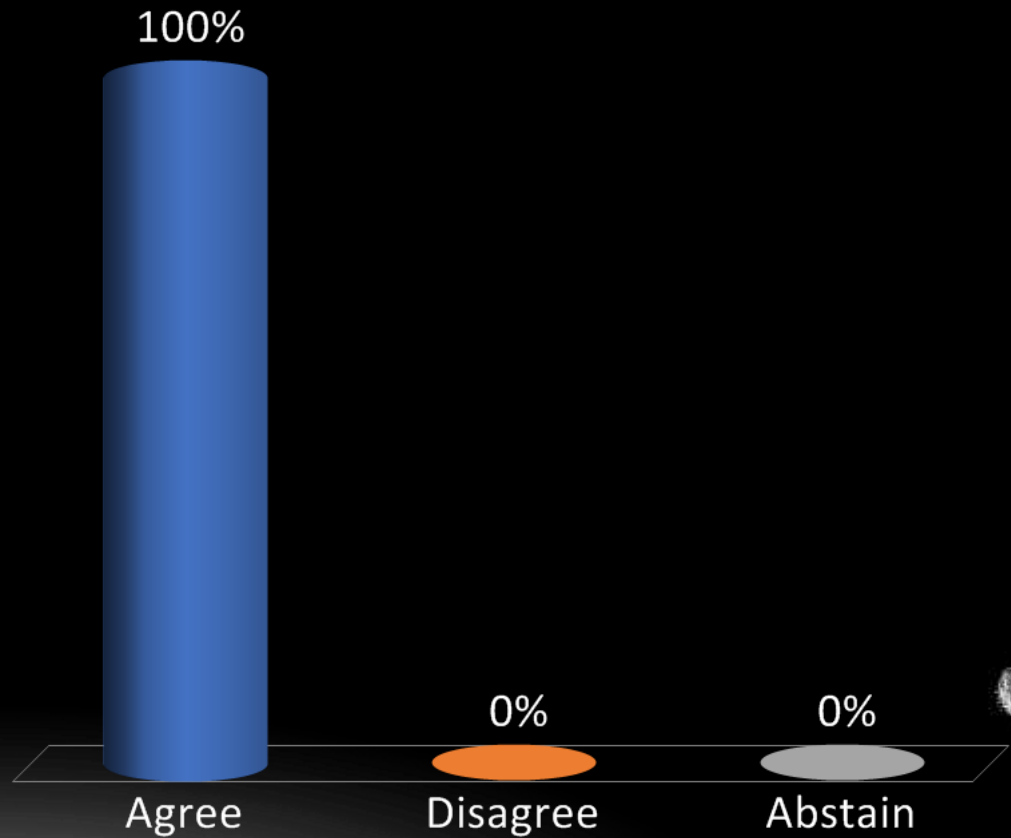
- * **Meta-analysis 0, Prospective/Randomized 1, Retrospective 11**
- * **14 studies reviewed (1 RCT, 13 Retrospective studies)**
- * **Of which, were 9 adult studies and 5 pediatric patient reports**
- * **Strong RCT evidence supports the use of arthroscopy as the initial treatment with 100% success at 2-year follow up (Matsumoto et al)**
- * **No significant increase in adverse events / readmission with arthroscopic treatment (Grauer et al) and improved ROM (Matsumoto et al)**
- * **All 5 pediatric retrospective studies support arthroscopic treatment of native septic arthritis with success rates 93.9%-100% (Dewar et al; Bonnard et al; Hennrikus et al; Steensen et al; Fu et al)**



Recommendation: Yes. Arthroscopy can be used for treatment of acute sepsis of the native knee joint.

Level of Evidence: Moderate

- A. Agree
- B. Disagree
- C. Abstain



Question Sport-13 (former Sport-19) What type of lavage solution should be used in patients with a native knee infection being treated with arthroscopy?

RESEARCHED BY:



Kevin Plancher MD, USA



Roberto Rossi MD, Italy



Literature:

* **Meta-analysis 0, Prospective/Randomized 1, Retrospective 38**

* Two studies with large patient numbers support saline irrigation without intra-articular antibiotics as the lavage solution of choice (Stutz et al; Aim F et al)

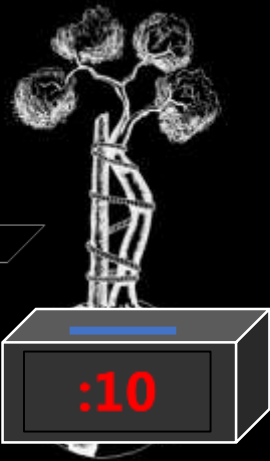
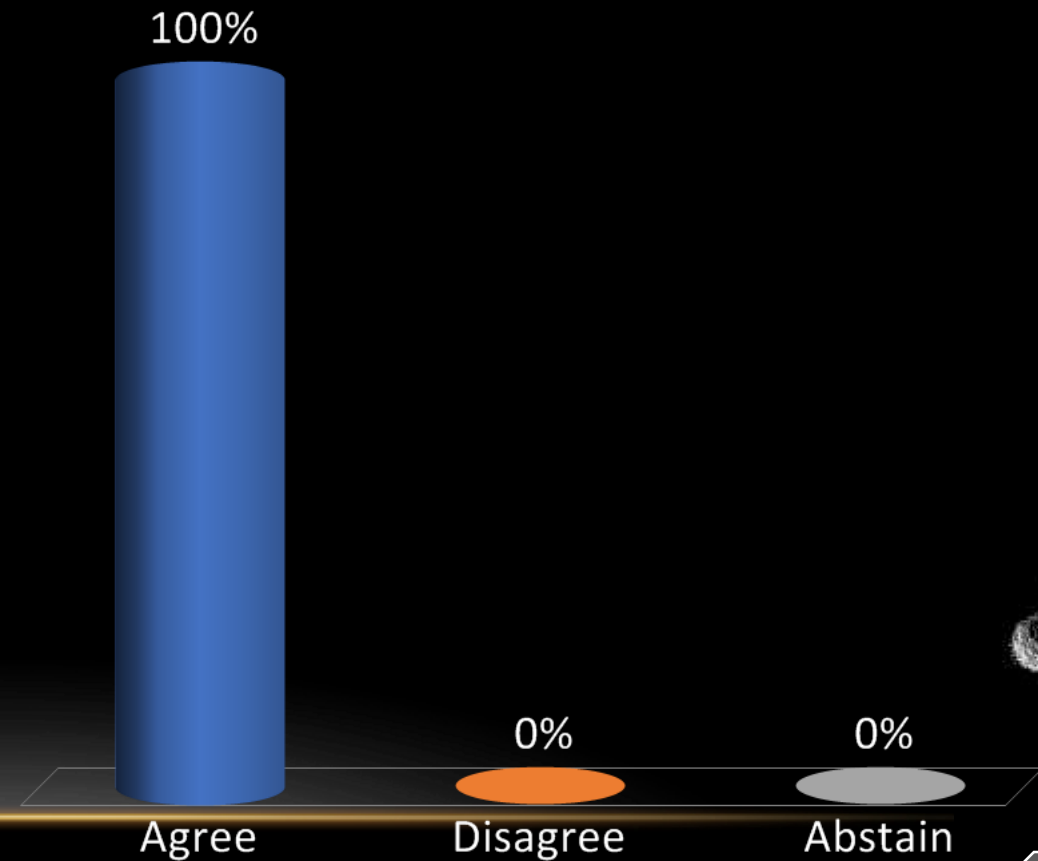
* While some are proponents of intra-articular antibiotics, there are concerns about resultant chemical synovitis and potential chondral toxicity, as well as the risk of increasing antibiotic resistance.



Recommendation: We recommend that high volumes of saline without antibiotics should be used as the arthroscopic lavage solution for native knee infection.

Level of Evidence: Limited

- A. Agree
- B. Disagree
- C. Abstain



Question Sport-14 (former Sport-6) Should a synovectomy routinely be performed during arthroscopic treatment of an acute infection following ACL reconstruction?

RESEARCHED BY:



Carl Haasper MD, Germany



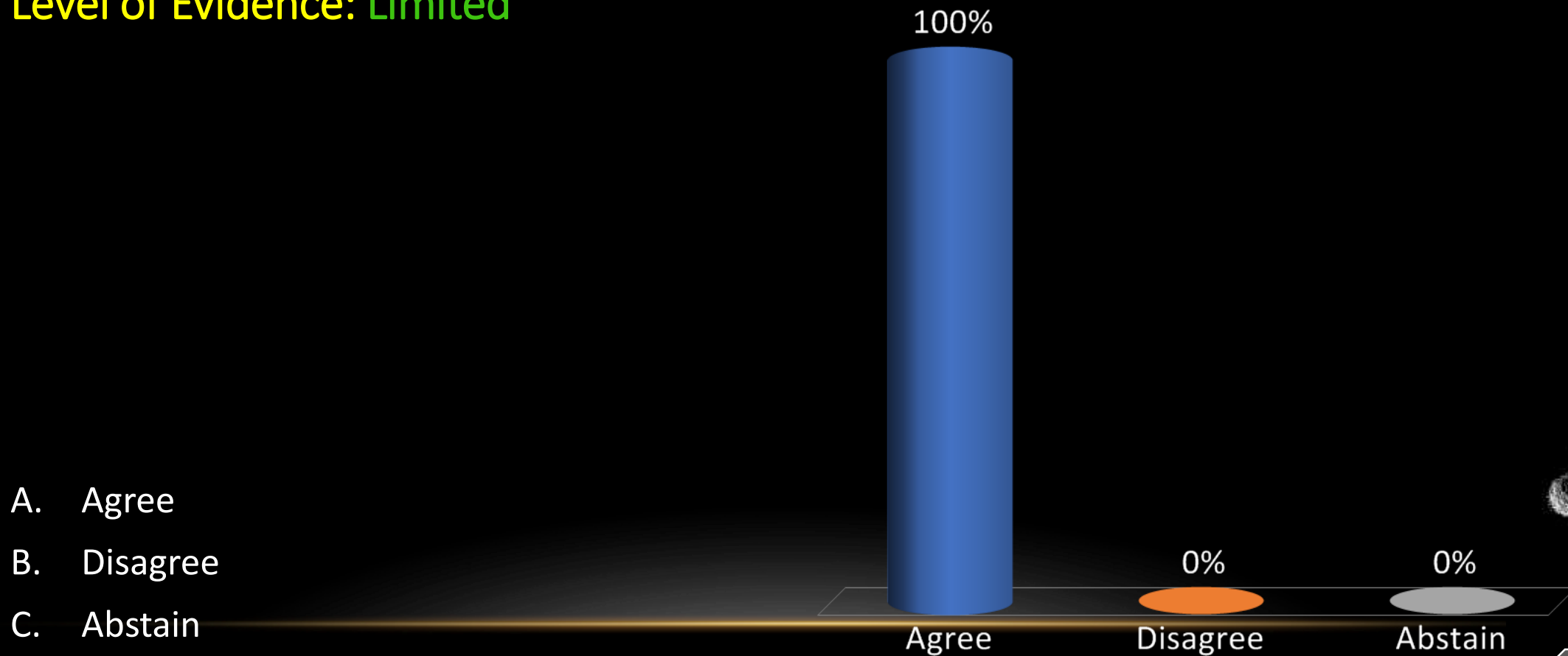
Literature:

- * **Meta-analysis 0, Prospective/Randomized 0, Retrospective 9**
- * **Gächter et al suggest the synovial membrane serves a natural barrier in infection, and primary synovectomy should be avoided in acute infections except for later stages (III and IV).**
- * **Other studies advocate a synovectomy during the first irrigation and debridement procedure with fair results (Van Tongel et al; Nag et al).**
- * **Zalavras et al. reported successful outcomes following a complete synovectomy.**
- * **However more recent papers again recommend a synovectomy only in stages 3 and 4 (Peterson et al).**

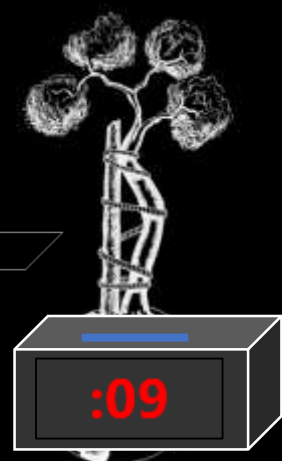


Recommendation: No. Total or partial synovectomy should be reserved for cases of severe or chronic infection.

Level of Evidence: Limited



- A. Agree
- B. Disagree
- C. Abstain



Question Sport-15 (former Sport-10) Should the graft and all hardware be removed in the treatment of patients with an acute infection following ACL reconstruction?

RESEARCHED BY:



Alan Ivković MD, Croatia



Jacek Kruczyński MD, Poland



Raul García-Bógalo MD, Spain

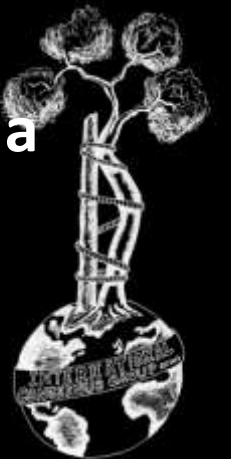


Literature:

*** Meta-analysis 2, Prospective/Randomized 1, Retrospective 4**

*** In a meta-analysis, Kursumovic et al. reported a success rate of 85% for graft retention and infection eradication. They analyzed 16 studies with a total of 147 knee infections after ACL reconstruction. Increased rates of failure were seen in cases with persistent infection requiring subsequent procedures, from 4.4% with one arthroscopic debridement, to 11.4% with two procedures, or 25% with more than three surgeries.**

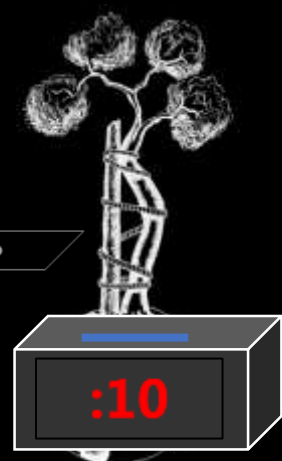
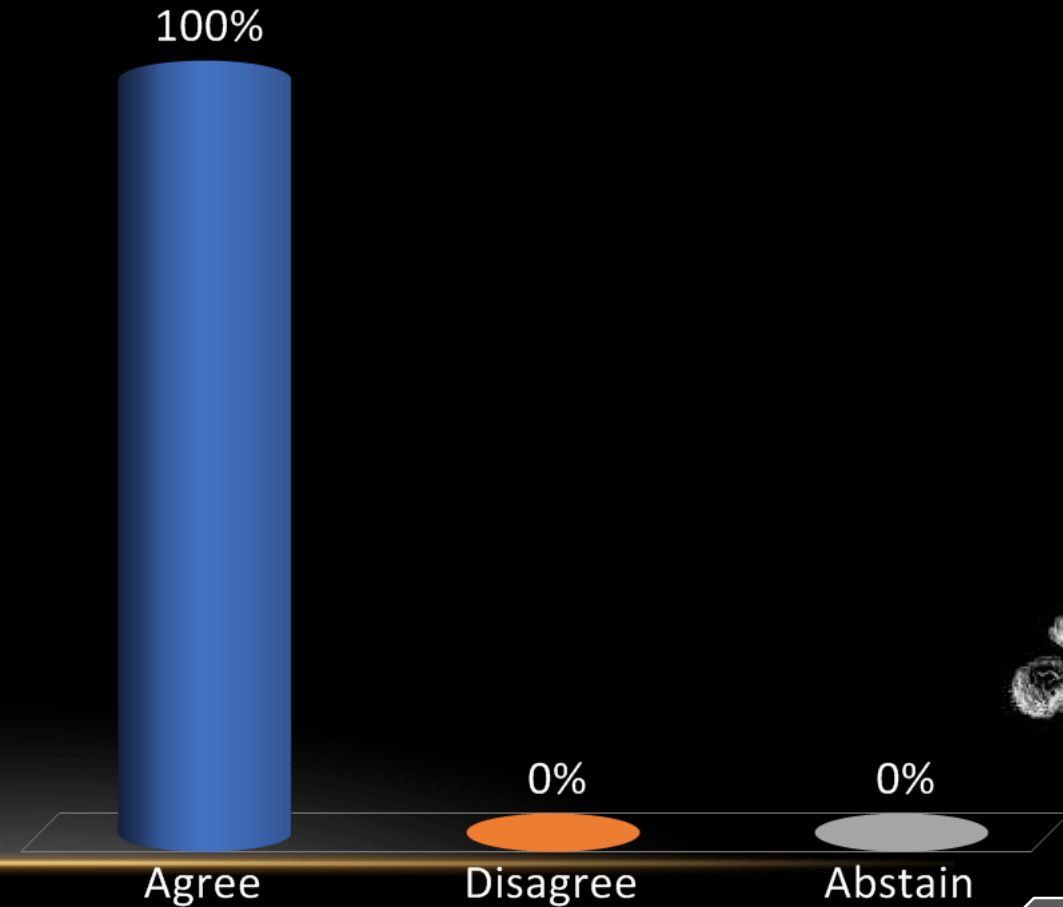
*** In a another systematic review, Mackhni et al analzsed 19 studies with a total of 203 cases of septic arthritis following ACL reconstruction and reported a success rate with graft retention of 78%.**



Recommendation: The initial approach to an acute infection following ACL reconstruction, should be arthroscopic irrigation and debridement, retention of a stable graft and hardware, and intravenous antibiotic therapy.

Level of Evidence: Moderate

- A. Agree
- B. Disagree
- C. Abstain



Question Sport-16 (former Sport-4) How many arthroscopic procedures are reasonable for management of an infected ACL reconstruction prior to considering graft and hardware removal?

RESEARCHED BY:



Alan Ivković MD, Croatia



Rocco Papalia MD, Italy



Christopher Dodson MD, USA



Literature:

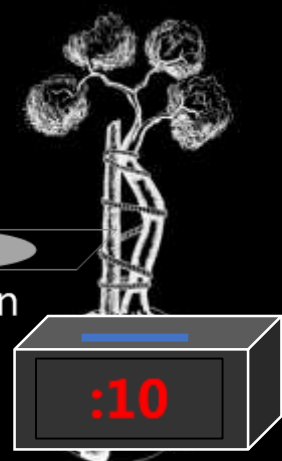
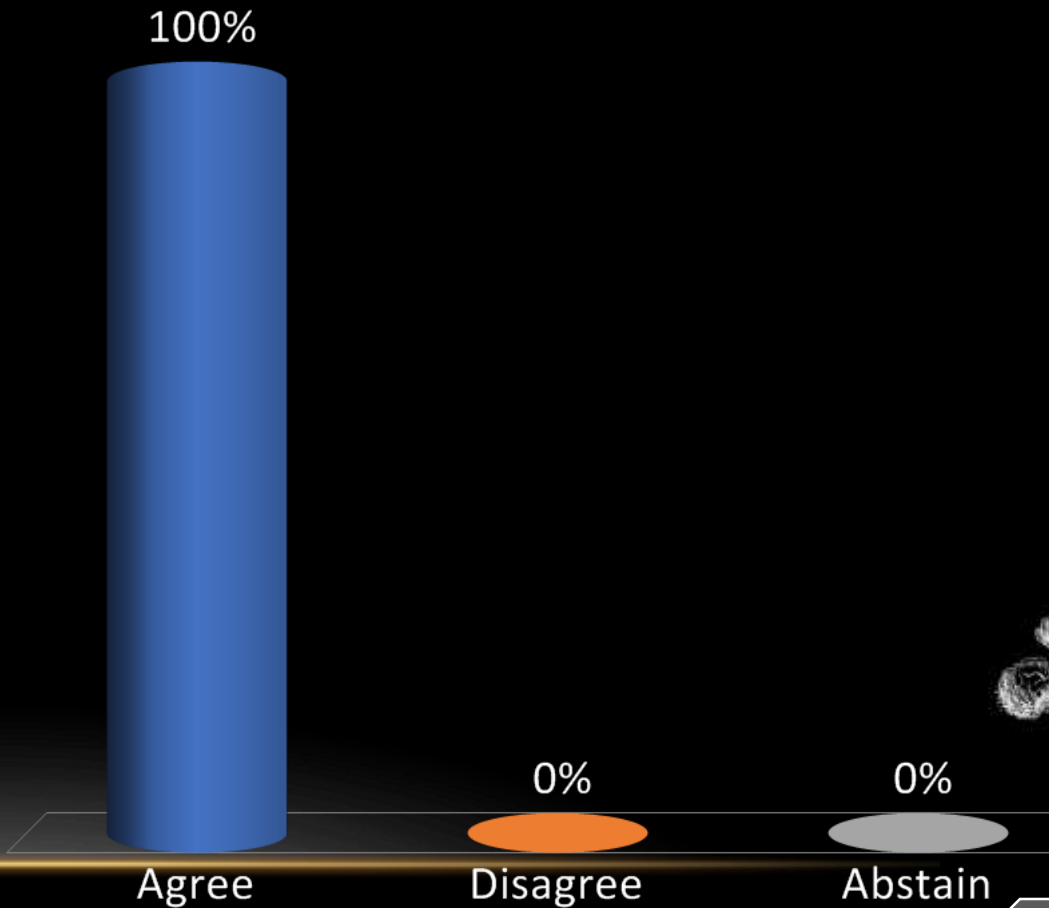
- * **Meta-analysis 2, Prospective/Randomized 1, Retrospective 11**
- * **Abdel-Aziz et al found a median of 3 (range 1-6) repeated arthroscopic debridement and synovectomy procedures were required to eradicate infection.**
- * **In another study by Schulz et al., irrigation and debridement successfully treated the infection after a mean of 2.2 procedures with no recurrences of septic arthritis or bone infection.**
- * **In a systematic review, Mouzopoulos et al. reported that patients over the age of 25 years require, on average, 1.12 more procedures to control infection compared to patients under the age of 25 years old.**



Recommendation: Prior to considering stable graft and hardware removal at least two arthroscopic procedures are reasonable for the management of an infected ACL reconstruction. There is evidence for successful treatment and graft retention with further arthroscopic procedures.

Level of Evidence: Moderate

- A. Agree
- B. Disagree
- C. Abstain



Question Sport-17 (former Sport-3) How many arthroscopic procedures are reasonable for management of an infected ACL reconstruction prior to considering arthrotomy?

RESEARCHED BY:



Jacek Kruczyński MD, Poland



Literature:

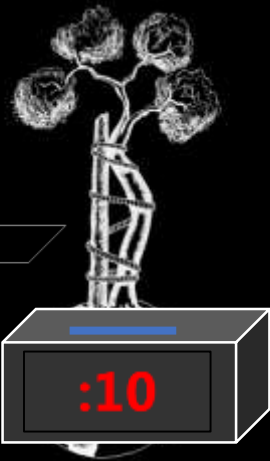
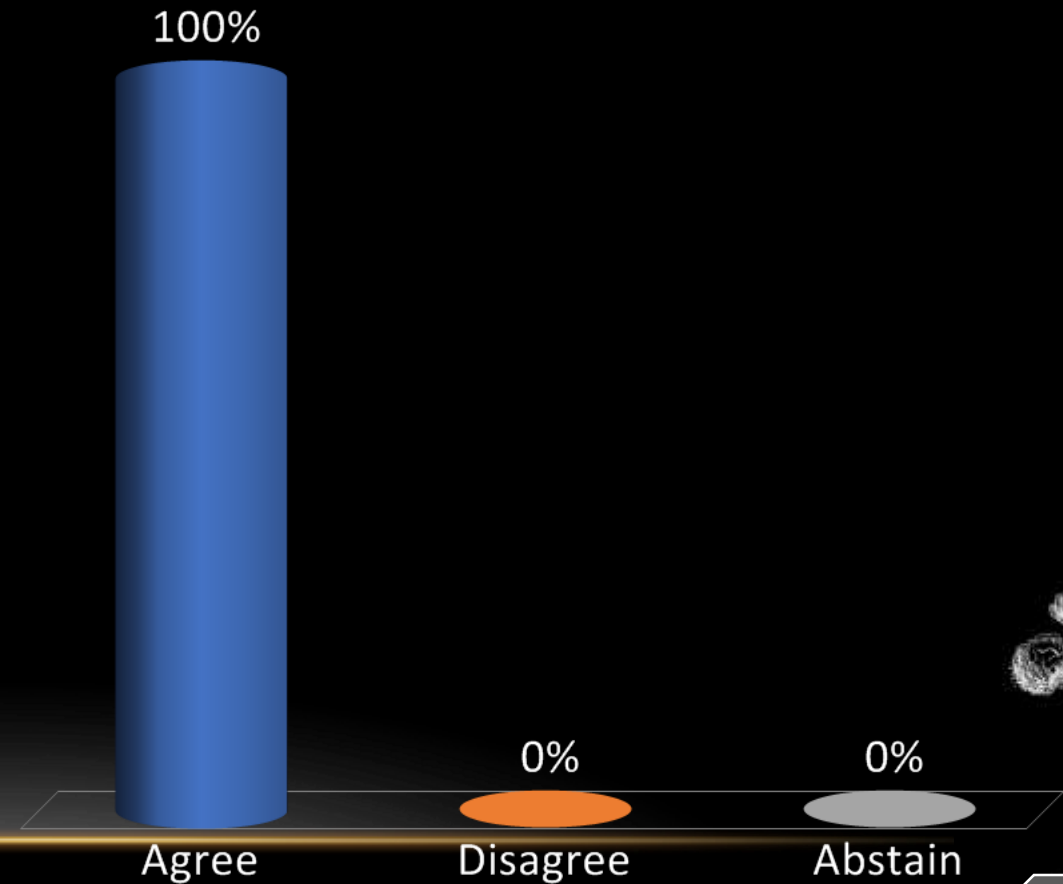
- * Systematic review 2, Prospective/Randomized 1, Retrospective 9**
- * Makhni et al. conducted a systematic review on functional outcomes following surgical treatment of the infected knee following ACL reconstruction. The studies included in the analysis demonstrated that up to 6 arthroscopic procedures were performed for the resolution of infection and symptoms.**
- * Another systematic review by Saper et al. concluded that arthroscopic debridement with graft retention is an effective treatment of infection following ACL reconstruction. The mean number of arthroscopic procedures per patient in these studies was 1.5 (range, 1 to 4).**



Recommendation: It is reasonable to treat acute infection of the knee following ACL reconstruction with arthroscopic debridement, repeating the arthroscopy up to six times, if necessary. The use of arthrotomy in the management of infected ACL cases is not well defined.

Level of Evidence: Limited

- A. Agree
- B. Disagree
- C. Abstain



Question Sport-18 (former Sport-15) What is the optimal duration of antibiotic treatment after surgical debridement of an infected ACL reconstruction? Should this be altered when autograft or allograft is retained?

RESEARCHED BY:



Rocco Papalia MD, Italy



Andy O Miller MD, USA



Literature:

*** Meta-analysis 1, Prospective/Randomized 1, Retrospective 23**

*** In a systematic review, Wang et al.[15] evaluated 17 articles that fulfilled the inclusion criteria of septic arthritis following ACL reconstruction. The authors found IV antibiotics were continued for an average period of 29.7 days following debridement and graft retention. IV antibiotics for an average of 4–6 weeks was recommended, which might then be changed to oral antibiotics as soon as the CRP levels drop to nearly normal values (<1 mg/mL).**

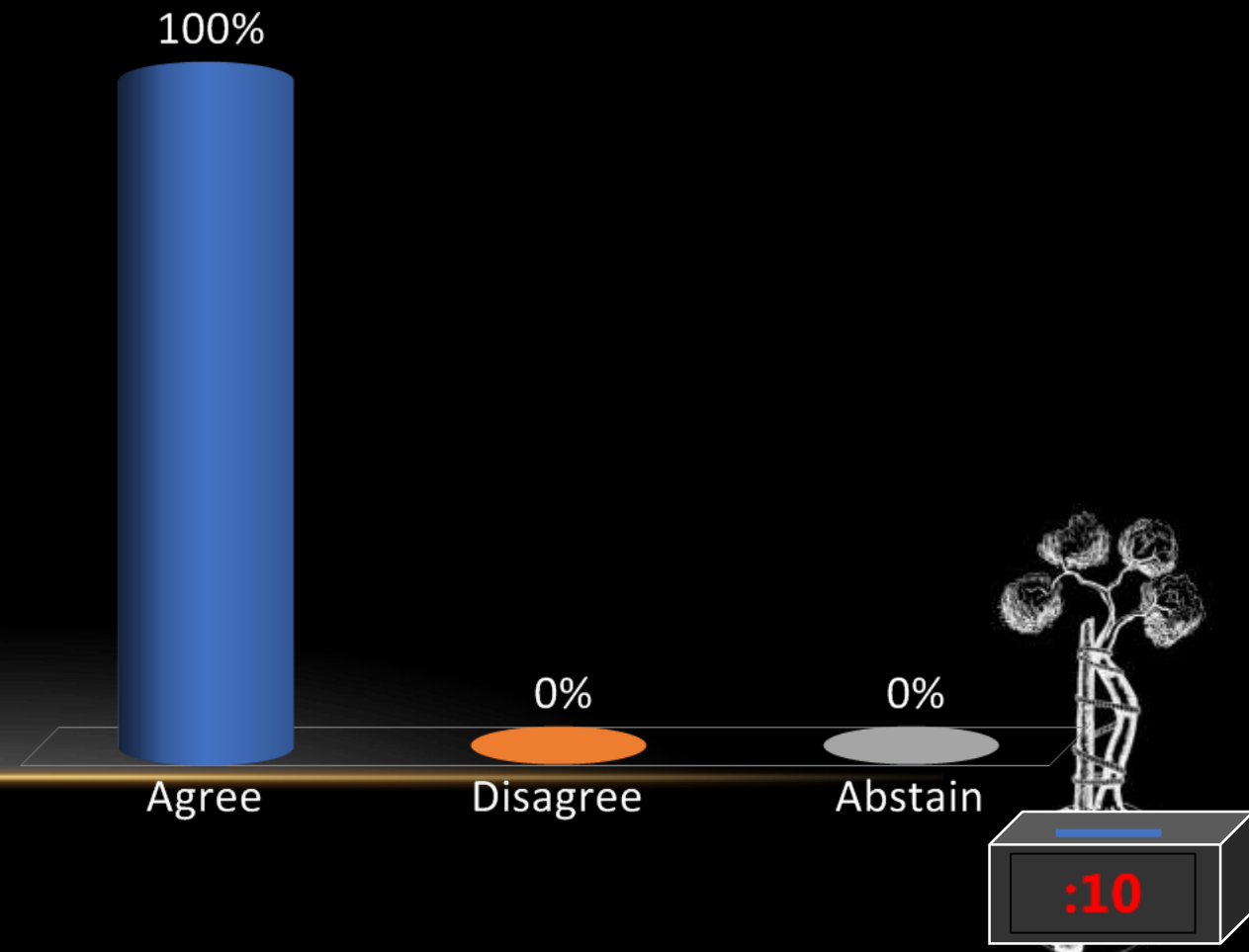
*** Mouzopoulos et al. proposed the basic management protocol with graft retention based on IV antibiotic therapy over at least 4 weeks followed by oral antibiotic for 2–4 weeks. An extended IV antibiotic therapy was given only in patients who needed more arthroscopic lavages.**



Recommendation: Following surgical debridement of an infected ACL, antibiotic treatment should be administered for 4-6 weeks and can be discontinued upon resolution of clinical signs and normalization of laboratory parameters. The available literature does not differentiate between retention or removal of autograft or allograft.

Level of Evidence: Consensus

- A. Agree
- B. Disagree
- C. Abstain



Question Sport-19 (former Sport-11) Should the rehabilitation protocol be modified after surgical debridement of an infected ACL reconstruction? If yes, what changes should be made in regards to range of motion and weight bearing status?

RESEARCHED BY:



Giuseppe Calafiore MD, Italy



James Murray MD, UK



Literature:

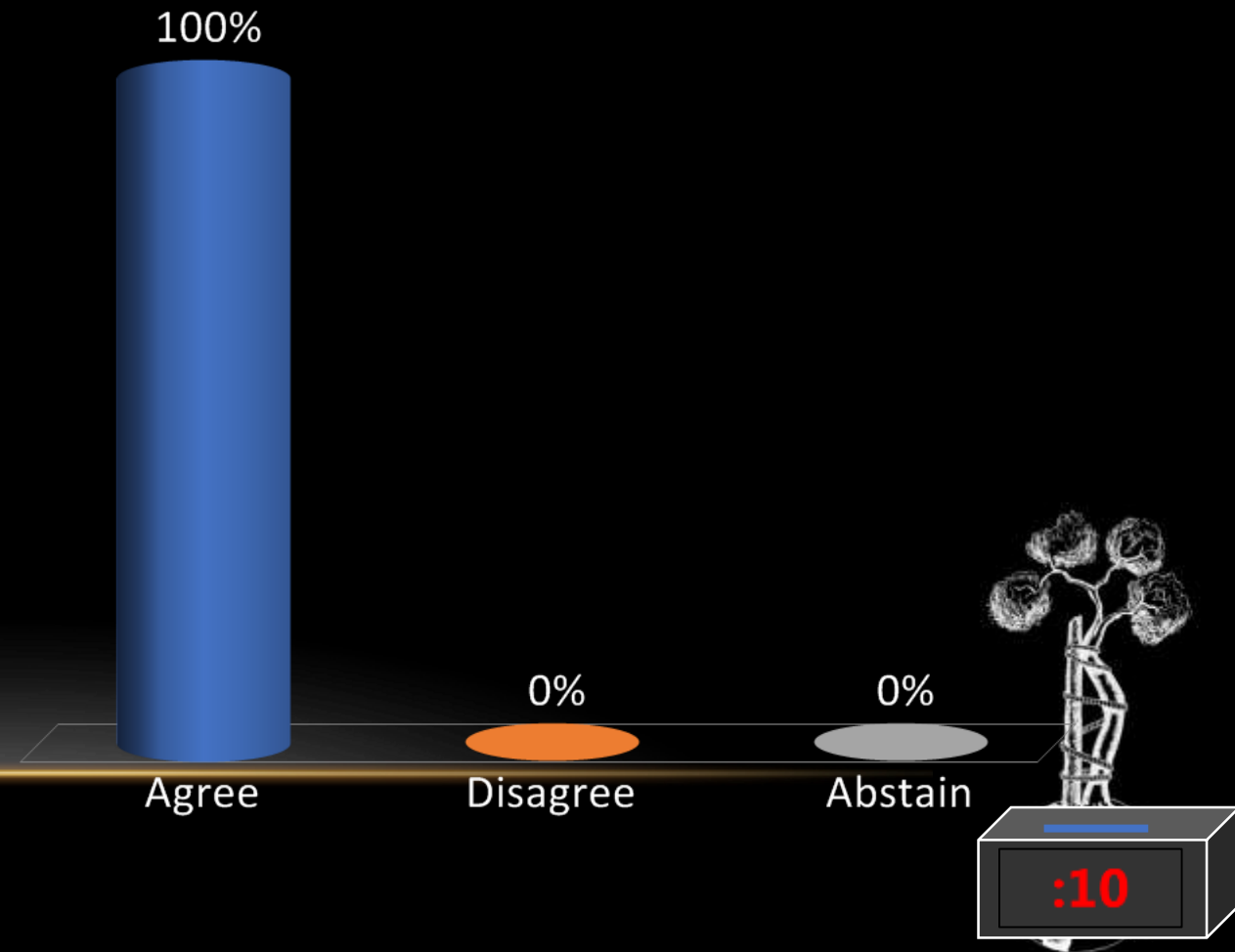
- * **Meta-analysis 0, Prospective/Randomized 1, Retrospective 15**
- * **While it is well established that a graded knee-strengthening program including quadriceps and hamstrings strengthening has to be started within the first post-operative days, there is no agreement regarding weight-bearing status and range of motion parameters.**
- * **With regard to weight-bearing status after treatment of ACL infection, Torres-Claramunt et al suggest to start a strengthening program two weeks after surgery with progressive weight bearing after symptoms decrease.**
- * **Likewise, weight bearing was gradually increased until resolution of symptoms in the rehabilitation protocol developed by Hantes et al.**
- * **However, McAllister et al and Schub et al suggest to begin the weight bearing six weeks after surgery.**



Recommendation: We recommend that rehabilitative treatment after surgical debridement of an infected ACL reconstruction with graft retention should not differ substantially from primary reconstruction; it should be focused on preventing stiffness and regaining motion through passive and active-assisted range of motion exercises before progressing.

Level of Evidence: Low

- A. Agree
- B. Disagree
- C. Abstain



Question Sport-20 (former Sport-20) When can patients safely undergo revision ACL reconstruction following treatment for prior infection?

RESEARCHED BY:



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Literature:

*** Meta-analysis 3, Prospective/Randomized 0, Retrospective 11**

*** Limited RCTs have been conducted in this setting, but several retrospective studies have been conducted in low numbers of revision ACL reconstruction following treatment for prior infection.**

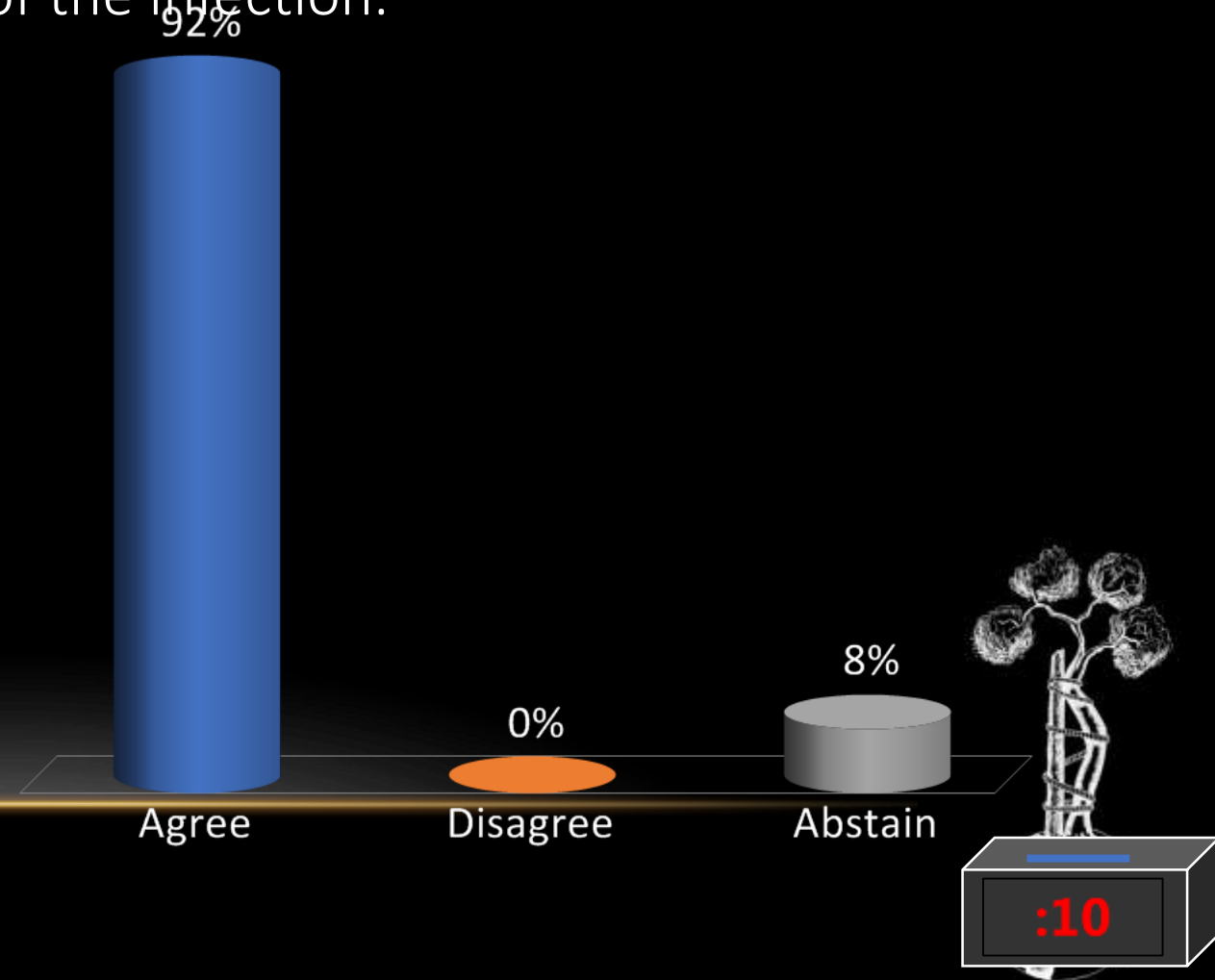
*** There is no consensus on the timing of revision, with a reported range of 3 weeks to over a year. In general, it seems appropriate to delay surgery for at least 6 weeks, but ideally 3 to 6 months post eradication of infection.**



Recommendation: It is considered safe to perform a revision ACL reconstruction following completion of successful treatment for infection and normalization of clinical and laboratory parameters upon resolution of the infection. The literature does not suggest a specific timeframe following resolution of the infection.

Level of Evidence: Consensus

- A. Agree
- B. Disagree
- C. Abstain



Test

