Gynecol Surg (2014) 11:153–156
DOI 10.1007/s10397-014-0841-9

OPINION

Role of prophylactic antibiotics in endoscopic gynaecological surgery; a consensus proposal

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Received: 7 November 2013 / Accepted: 24 March 2014 / Published online: 11 April 2014

Abstract Surgical site infection can result in increased morbidity for the patient, prolonged hospital stay and hospital readmission. Preoperative antibiotics reduce the incidence of such infections, particularly in open surgery. Universal use of antibiotic prophylaxis, however, is not recommended due to the risks of adverse reactions, generation of resistant bacteria and additional cost. Endoscopic procedures carry low risk of wound contamination and infection. Limited data suggest wide variability in antibiotic prophylaxis in gynaecological surgery and potential overuse of antibiotics in gynaecological endoscopic surgery. Bringing together the existing evidence allows for a consensus proposal for the use of preoperative antibiotics in gynaecological endoscopy.

Keywords Laparoscopy · Hysteroscopy · Gynaecological surgery · Prophylactic antibiotics

Background

Surgical site infection is a common postoperative complication and can result in increased morbidity for the patient, prolonged hospital stay and hospital readmission [1]. In gynaecological surgery, up to 8–10 % of patients develop surgical site infection [2]. The administration of preoperative antibiotics has been reported to be an important intervention to prevent such infections [3]. The aim is to achieve high levels of a broad-spectrum antibiotic at the surgical wound to avoid contamination by microorganisms. An intravenous dose is administered at induction of anaesthesia, whereas further doses do not appear to be beneficial [4]. Still, administration of prophylaxis is not universally recommended, as not all surgical procedures carry a significant risk of wound contamination and infection [5]. Unnecessary administration of antibiotics may be detrimental as it can result in additional costs, adverse reactions and the emergence of resistant bacteria [6]. A recent survey performed in the USA showed wide variability in antibiotic prophylaxis in gynaecological surgery [7].

Laparoscopic procedures are performed via small abdominal incisions and trocars that isolate the operating site from the external environment. Hysteroscopic surgery is also minimally invasive surgery performed via the cervical orifice. It is therefore thought that the risk of contamination in endoscopic surgery is much lower compared to open surgery and the use of antibiotics may not confer any additional benefit [8]. Endoscopic gynaecological surgeons practicing in the United Kingdom currently have no available national recommendations on which to base their practice in relation to antibiotic prophylaxis; hence, practice is likely to differ between various hospitals and individual surgeons. Our group recently performed a relevant survey. Gynaecologists in the UK were asked to state whether they administer antibiotic prophylaxis for different endoscopic procedures. Although no solid conclusions could be drawn due to the low response rate the survey achieved, the responses were remarkably varied, thus enhancing our impression of varied practice (data not shown).

Classification of surgical wounds

Surgical wounds can be classified in four classes according to their potential for contamination and infection [9]. Class I/clean procedures are those where no inflammation is encountered and the respiratory, alimentary or genitourinary tracts are not entered. In laparoscopic gynaecological surgery, procedures such as diagnostic laparoscopy, laparoscopic sterilisation, excision of mild endometriosis, ovarian cystectomy and salpingo-oophorectomy fall into this category.

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In class II/clean-contaminated procedures, the respiratory, alimentary or genitourinary tracts are entered but under controlled conditions and without unusual contamination or spillage, for example, a laparoscopic total hysterectomy or an excision of a rectovaginal nodule with a breech to the vagina. Class III/clean-contaminated procedures carry high risk of infection and involve operations where acute inflammation (without pus) is encountered, or where there is visible contamination of the wound. Examples include gross spillage from a hollow viscus during the operation or compound/open injuries operated on within four hours. Finally, class IV/dirty-infected operations are those performed in the presence of pus, where there is a previously perforated hollow viscus, or compound/open injuries more than 4 h old. Clearly, the majority of laparoscopic pelvic procedures performed in the UK (basic, intermediate and potentially some advanced laparoscopic procedures) are class I/clean operations, i.e. procedures with the lowest possible risk of contamination and infection.

Review of existing evidence and published recommendations

Guidelines on the use of antibiotic prophylaxis in gynaecological endoscopic surgery have been produced by the Society of Obstetricians and Gynaecologists of Canada (SOGC) [10], the American College of Obstetricians and Gynecologists (ACOG) [6] and the Surgical Infection Prevention Project [11]. In contrast, such official published guidance is lacking in most European countries. There exists one randomised controlled trial (RCT) which evaluated antibiotic use in benign gynaecological laparoscopic procedures (excluding hysterectomy) published to date [12]. The study found no statistically significant differences between prophylaxis and no prophylaxis for any of the infectious outcomes, suggesting that in certain types of operations antibiotics do not offer any benefit compared to placebo. Based on the above data, the SOGC recommends against the use of prophylaxis for laparoscopic procedures that do not involve breach to the uterine cavity or vagina. A second RCT found no differences in infection rates between two different antibiotics (amoxicillin-clavulanic acid and cefazolin) used for prophylaxis in a variety of laparoscopic procedures that included total hysterectomy [13]. This RCT however involved no placebo-controlled group; therefore, no conclusions can be drawn regarding the actual benefit of prophylaxis. There are therefore no RCTs assessing the role of prophylactic antibiotics in any type of laparoscopic hysterectomy. A Cochrane review concluded that the rates of surgical site infection and febrile morbidity in laparoscopic hysterectomy are lower compared to abdominal hysterectomy and similar to vaginal hysterectomy [14]. Therefore, based on evidence from studies on vaginal hysterectomies, it is sensible to recommend antibiotic prophylaxis in laparoscopic hysterectomies [10]. Furthermore, total laparoscopic hysterectomy and laparoscopically assisted vaginal hysterectomy are class II/clean-contaminated procedures which carry a moderate risk of infection and can benefit from antibiotic prophylaxis. Subtotal (supracervical) laparoscopic hysterectomy may be considered a class I procedure, since the vagina is not entered. However, surgical site infection rates are again similar to vaginal hysterectomies, and therefore, antibiotics are likely to be beneficial based on the aforementioned rationale [10].

In terms of hysteroscopic surgery, an adequately powered prospective randomised study of 116 women undergoing hysteroscopic resection or laser ablation failed to produce conclusive evidence on the benefit of antibiotic prophylaxis [15]. A further pseudo-randomised study involving 631 women undergoing diagnostic hysteroscopy showed no difference

Table 1 Table summarizing the conclusions of available international guidelines [6, 10]. The quality of evidence assessment and classification of recommendations originate from the Canadian Task Force on Preventive Health Care [21]. The key to the evidence statements and grading of recommendations is shown below

Endoscopic procedure	Antibiotic prophylaxis	Level of evidence
Laparoscopic hysterectomy (total/subtotal/laparoscopically assisted vaginal hysterectomy)	Recommended	III-B
Laparoscopic procedures with no breach to the uterine cavity or vagina	Not recommended	I-E
Hysteroscopic surgery	Not recommended	II-2D

I—Evidence obtained from at least one properly randomized controlled trial. II-1—Evidence from well-designed controlled trials without randomization. II-2—Evidence from well-designed cohort (prospective or retrospective) or case–control studies, preferably from more than one centre or research group recommendation for or against use of the clinical preventive action; however, other factors may influence decision-making. II-3—Evidence obtained from comparisons between times or places with or without the intervention. Dramatic results in uncontrolled experiments (such as the results of treatment with penicillin in the 1940s) could also be included in this category. III—Opinions of respected authorities, based on clinical experience, descriptive studies or reports of expert committees. A—There is good evidence to recommend the clinical preventive action. B—There is fair evidence to recommend the clinical preventive action. C—The existing evidence is conflicting and does not allow to make a recommendation for or against use of the clinical preventive action; however, other factors may influence decision-making. D—There is fair evidence to recommend against the clinical preventive action. E—There is good evidence to recommend against the clinical preventive action. L—There is insufficient evidence (in quantity or quality) to make a recommendation; however, other factors may influence decision-making

in post-procedural infection between the prophylaxis and no prophylaxis groups [16]. In this study, patients either received or did not receive antibiotic prophylaxis based on the local protocol of the hospital they attended. The variable design and nature of the aforementioned studies does not allow a meta-analysis of their results, and a recent Cochrane review of prophylactic antibiotics for transcervical intrauterine procedures failed to identify any RCTs that met their criteria for inclusion in a meta-analysis [17]. Still, the data of the aforementioned studies were assessed as robust enough by the SOGC to recommend against the use of prophylaxis in hysteroscopic surgery [10]. Taken together, the conclusions of available international guidelines are shown in Table 1 below.

Certain special circumstances should be considered separately, for example, cases of prolonged surgery and pregnancy. Duration of surgery is positively associated with risk of wound infection. This risk is additional to that of the classification of the procedure [18]. Although no evidence exists for gynaecological laparoscopic or hysteroscopic surgery, it is sensible to consider prophylaxis in unusually prolonged procedures. Similarly, a pregnant patient who undergoes a class I gynaecological procedure (for example ovarian cystectomy) should be given prophylaxis in line with recommendations published for other types of surgery in pregnant women [18].

Discussion and conclusions

Preoperative antibiotics have the potential of reducing febrile morbidity and wound infection rates for a wide range of surgical procedures [19]. Their use comes with the disadvantages of additional cost, risk of anaphylactic reaction and potential contribution to the development of resistant bacterial strains. A large proportion of laparoscopic pelvic procedures performed in the UK are class I/clean procedures which carry low risk of infection.

We believe that in the absence of relevant national guidance, antibiotics may be overused in endoscopic surgery in the UK and potentially other European countries. That may be particularly true for class I/clean endoscopic procedures where some evidence against the use of antibiotics exists already. Further research is much needed on the subject. We recommend further randomised placebo-controlled trials to investigate the role of prophylaxis in hysteroscopic as well as advanced laparoscopic surgery and robotic gynaecological surgery. Such studies should be sufficiently powered and therefore likely multicentre to recruit the required numbers of patients.

Given the relative lack of robust data from studies investigating gynaecological procedures, evidence from other types of surgery may also be extrapolated to draw consensus [20]. For example, a Cochrane review looking at laparoscopic cholecystectomy observed no statistically significant differences between antibiotic prophylaxis and no prophylaxis in the proportion of surgical site or extra-abdominal infections [8]. The meta-analysis involved 11 RCTs with 1,664 patients in total (900 in the prophylaxis group and 764 in the no-prophylaxis group). Surgical site infection rates were similar in the two groups; 2.7 % patients in the prophylaxis group had a surgical site infection against 3.3 % in the no-prophylaxis group. The odds ratio was 0.87, 95 % confidence interval (0.49 to 1.54). Overall, the review suggested that there is not sufficient evidence to support or refute the use of antibiotic prophylaxis to reduce surgical site infection. The results of the meta-analysis however have been adopted by the Scottish Intercollegiate Guidelines Network which recommends against prophylaxis for laparoscopic cholecystectomy unless other additional risk factors are present such as immunosuppression, pregnancy and existing infection [18].

In conclusion, review of published evidence suggests that laparoscopic procedures which do not involve entry to the vagina, uterine cavity or other viscera do not require antibiotic prophylaxis. The data on hysteroscopic surgery are weaker and although antibiotics may not appear to be beneficial, we suggest clinical judgment be used for each individual case. There is paucity of high-quality evidence and priority needs to be given to undertaking high-quality randomised controlled trials to address the subject of antibiotic prophylaxis in gynaecological hysteroscopic, laparoscopic and robotic surgery.

Conflict of interest The authors have no conflict of interest to declare

Informed consent statement This article does not contain any studies with human or animal subjects performed by any of the authors.

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