Review Article

Antibiotic Prophylaxis in Plastic Surgery: From Systematic Review to Operative Algorithm

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ABSTRACT

BACKGROUND

We aimed to provide a single, viable and user-friendly operative protocol for preoperative antibiotic prophylaxis that meets the needs of all plastic surgery practitioners.

METHODS

The research was conducted through the abstract and citation databases of peer-reviewed literature Pubmed® (National Center for Biotechnology Information), Medscape® (General Surgery) and Scopus® (Elsevier), comparing existing data from 2010 to 2020. A separated and dedicated research was accomplished for each of 8 macroareas such as: skin and soft tissue, hand, breast, aesthetics, head and neck, trauma, burns and miscellaneous.

RESULTS

The findings for each macroareas included the choice of the antibiotic, the route and timing of administration and the clinical applications. Finally, the review has been condensed in an operative algorithm for antibiotic use to apply in each field of plastic surgery.

CONCLUSION

We could provide plastic surgeon an effective, easy-to-use operative protocol for antibiotic prophylaxis in daily activity.

KEYWORDS

Aesthetic surgery; Antibiotic prophylaxis; Plastic surgery; Surgical site infection

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INTRODUCTION

Antibiotic prophylaxis consists in antibiotic administration just before surgery to reduce the incidence of surgical site infections (SSI). The SSI is linked to the surgery when occurs within the post-op 30 d or the 12 months in case of prosthesis implantation. Infection can be localized at the site of incision, but can also develop in deeper tissues[1]. The infection has a significant impact on patients' morbidity and lethality and extra costs for health service.

In countries with medium/low income, as shown by the guidelines

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of WHO, SSI is the type of infection that leads to a higher percentage of hospitalization[2]. Therefore, prevention plays an important role.

Eberlin et al[3] reported the importance of the code of conduct and hygienic standard in the pre-op period; in particular adequate surgeon hand washing and the use of antiseptic solutions.

In Italy, the rate of SSI ranges between 2.6% and 15%, according to the WHO, as reported by the National System of Surveillance of surgical site infections for 355 departments[2]. Procedures can be divided into clean surgery, contaminated surgery, clean-contaminated surgery, contaminated-dirty surgery (Table 1).

There are several factors involved in the development of an SSI. They can be linked to the patient or the surgical procedure (Table 2).

In the Scottish guidelines[4] great importance is given to the possibility of developing an ISS, in particular when ASA score is >2, in the presence of wound contamination, and concerning surgery type and duration.

The National Nosocomial Infections Surveillance (NNIS) risk index score shows how the ISS increases according to these factors. Most frequently pathogens involved in SSI are: *Staphylococcus Aureus, S. Coagulasis negative, Enterococci, Pseudomonas aeruginosa, mycobacteria* and *Vibrio* species[5].

Table 1: Definition of grade of wound contamination

Type	Description
CLEAN SURGERY	An uninfected operative wound in which no inflammation is encountered, and the respiratory, alimentary, genital, or uninfected urinary tract is not involved. Also, clean wounds are primarily closed and, if necessary, drained with closed drainage. Operative incisional wounds that follow no penetrating trauma should be included in this category if they meet the criteria.
CLEAN- CONTAMINATED SURGERY	Procedures on the respiratory, gastrointestinal and genitourinary systems in the absence of infection. They include procedures on the biliary tract, appendix, vagina and oropharynx in the absence of an ongoing infection
CONTAMINATED SURGERY	Procedures in which there are sign of acute inflammation, without pus or where there is a visible contamination of the wound, such as copious losses of material from a hollow bowel during surgery or compound/open wounds, which occurred less than 4 h before the intervention
DIRTY SURGERY	Procedures carried out in the presence of pus or on a previously perforated hollow bowel or on compound/open wounds that occurred more than 4 h after surgery.

Table 2: Risk factors for surgical site infection (SSI)

Patient Related	Intervention Related
Old age	Antisepsis and skin cleaning
Nutritional deficiency	Preoperative preparation of the skin
Obesity (weight>20% compared to the ideal one)	Duration of the intervention
Diabetes mellitus	Antibiotic prophylaxis
Smoke	Mechanical ventilation of the airways
Infections on other sites	Inadequate sterilization of the instruments
Bacterial colonization (e.g. s. aureus in the nose)	Foreign material at the surgical site
Immunosuppression (steroids or other conditions)	Postoperative hypothermia
Prolonged postoperative hospital stay	Surgical complications
Preoperative ascertained positivity to multi-resistant organisms	Type of surgery
Rheumatoid arthritis	Transfusions
Malnutrition and hypoalbuminemia	Perioperative blood glucose levels
Depression	

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The decrease of allergic reactions and *Clostridium difficile* disease and the abatement of health care costs are further benefits resulted from proper antibiotic prescription.

Plastic surgery covers a wide range of procedures, spreading to oncoplastic, head and neck, breast surgery, melanoma and skin cancer, hand surgery and aesthetics. To date, there is no single guideline that comprehends so many procedures, but several studies and reviews focused on a specific surgery field.

Only by the analysis of research on each different aspect of such complex surgery, a valid strategy in clinical practice can be extrapolated. We aimed to provide a single, viable and user-friendly operative protocol for preoperative antibiotic prophylaxis that meets the needs of all plastic surgery practitioners.

METHODS

The research was conducted through the abstract and citation databases of peer-reviewed literature Pubmed® (National Center for Biotechnology Information), Medscape® (General Surgery) and Scopus® (Elsevier), comparing existing data from 2010 to 2020.

For each of the above-mentioned databases, the keywords used were: "antibiotic prophylaxis", "guidelines", "plastic surgery", "aesthetic surgery", "surgical site infection". Keywords were used singularly or in combination (with Boolean operator AND) to better define the research respect the topic.

Data collection process extended from Mar 1st to Apr 30th 2020, reports were independently extracted for every preselected macro-area (e.g. hand surgery,

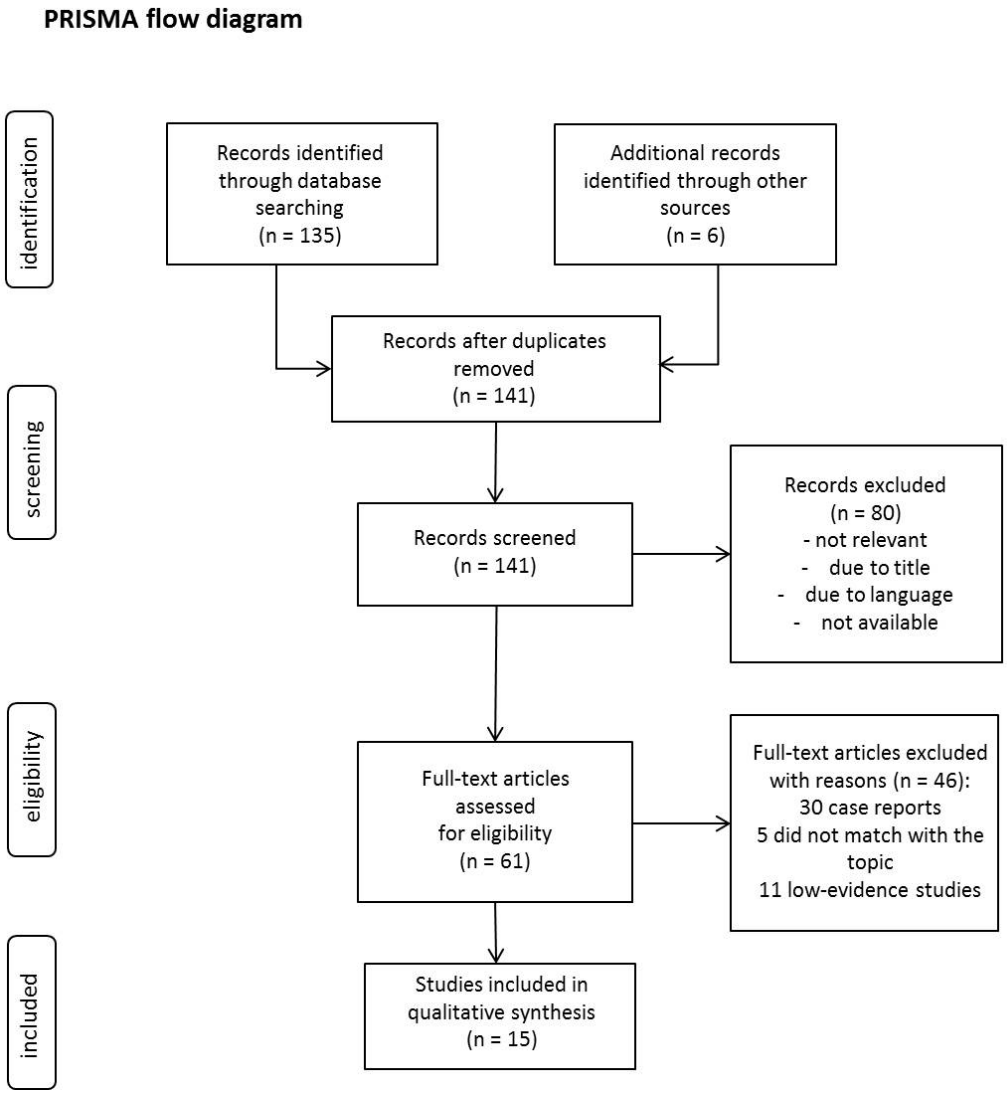


Fig. 1: Prisma flow diagram of the literature systematic research

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aesthetics, breast, etc.).
Reports considered eligible were meta-analysis (review), experimental studies (randomized or not), and observational studies (cohort and case-control). All reports had to be published, English and EU languages were accepted without exception.
Low-evidence studies, such as case reports or case series, were excluded, and so the research did not fit the topic.
The data research has been also expanded to the official websites of EU and North America Plastic Surgery national societies; in this case, the exclusive criteria for inclusion was the presence of a formal guideline regarding antibiotic prophylaxis. The data collecting flow diagram is reported in Figure 1 according to the PRISMA statement[6].

RESULTS

The studies included in the systematic review are summarized in Table 3**.** Due to the heterogeneity of the records selected in the review, the GRADE* rating[7] was applied to results to present a summary of evidence and provide a systematic approach and quality assessment (Table 4).

The choice of the antibiotic

The most used antibiotic group is I and II generation cephalosporins: Cefazolin (2000 mg) or cefuroxime (2000 mg) on single administration[8].
The use of glycopeptide must be reserved for prosthetic implant surgery, or if an MRSA colonization has been identified.
Generation III and IV cephalosporins, monobactams, carbapenems, piperacillin/tazobactam are not recommended for prophylactic use; usually, they are reserved for therapeutic uses on multidrug-resistant pathogens[9].
Patients with a medical history of anaphylaxis, larynx edema, bronchospasm, hypotension, local swelling, or rashes immediately after penicillin administration are more at risk of beta-lactam hypersensibility: the cross-reactivity with cephalosporin has been estimated at 10% but there is a lower chance if II generation is used[4].
In case of allergy, the antibiotic of choice is Clindamycin 600 mg[1,2]. Our research has not ascertained studies about antibiotic prophylaxis in areas with high prevalence of extended-spectrum beta-lactamases (ESBL) producing pathogens, in addition, no studies have been identified concerning the usefulness of routine screening for this pathogens[3].
In the Italian Society of Orthopedics and Traumatology (SIOT) guidelines the debate on a possible switch for all the patients to prophylaxis with glycopeptides or the association vancomycin-cephalosporin[7].
This type of prophylaxis has resulted in having a lower incidence of infections only in cardiac surgery procedures, but also a greater incidence of acute renal failure, with no significant effects on *Clostridium difficile* infections.

Route and timing of administration

A large number of studies have investigated the correct time of administration of antibiotic prophylaxis: most of them agree with intravenous administration 30-60 min before surgical incision[1,2,4,8,9].
The timing varies concerning the specific molecule and its half-life (e.g. vancomycin, it is necessary to begin a slow infusion 2 h before incision).
Preoperative antibiotics are ideally administered at least 5 min before, and within an hour, the insufflation of an extremity tourniquet, to guarantee adequate levels in the desired tissue at the time of incision[5].
An additional dose is requested when patient experiences a blood loss of 1500 ml (25 ml/kg in children), with a hemodilution > 15 ml/kg or if the procedure's length has doubled the antibiotic half-life (about three hours with cefazolin).
An extension of the antibiotic prophylaxis up to 72 h is justifiable only in case of high-risk index[1].

Clinical applications

Skin and soft tissue. According to the Italian Society of Plastic Reconstructive and Aesthetic Surgery (SICPRE) guidelines[1] and Aryan[5] meta-analysis, prophylaxis in elective clean surgery is not required when only skin and soft tissue are involved in.
Breast. For the Italian National Institute of Health (ISS) lumpectomy, breast cancer surgery and reduction mammoplasty do not require antibiotics administration[9], but breast augmentation does.
Scottish guidelines and Aryan[5] meta-analysis agree with the latter indication, but not with the former ones. Together with Huang[10], they indicate antibiotic use in all these types of procedures.

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Table 3: Summary of reviews and guidelines for antibiotic prophylaxis in plastic surgery procedures

Author	Dermatosurgery	Breast Augmentation	Breast reduction	Gynecomastia	Mastopexy	Breast cancer	Abdominoplasty	Lipofilling	Head-neck malignancy	Lymph node	Rhinoplasty	Blepharoplasty	Otoplasty	Face Lifting	Soft tissue surgery	Bone	Skin wound	Farm injury	Hand closed fracture	Distal phalanx open fracture	Hand open fracture	Bites	Microsurgery	Pressure sores	Major surgery	Hirudotherapy	Burns
SICPRE	N	I	I	I	I	I	N	N	N	N	N		N	N	N	N			N	N	N		I		I		
SCOTTISH		I	I	I	I	I			I	I	I		N	N													
ISS		I	N			N			I	I	N		I		N	N				I	I	I					
Vasconcelos															N	N	N										
Eberlin KR															N	N	N		N		I	I	I				
Zapata- Copete J		I	I		I	I																					
Huang		I	I		I	I																					
Phillips		I	I		I	I																					
Metcalfe																					I						
AICPE		I	I	I	I		I	I			I	I		I													
Robinson, Patel, Herlin																										I	
Yaffe MA																		I									
Aryan		I	I	I	I	I					N	N	N		N	N											
NICE																						I					
Ramos, Barajas-Nava, Avni, Chahed, Csenkey,																											N

Antibiotic prophylaxis: N - not indicated, I - indicated

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Table 4: Summary of findings and Grade of Evidence Rating

Included studies				Quality assessment						
First author	year	No. of studies/ subjects	Study design	Risk of bias	Imprecision	Inconsistency	Indirectness	Publication bias	Other considerations	Quality of evidence
SICPRE[1]	2018	45	non-systematic review	very serious[a,e]	serious[b]	very serious[k]	serious[d]	undetected	none	very low
SCOTTISH[4]	2008	218	systematic review	very serious[a,f,h]	not serious	not serious	very serious[g]	undetected	none	moderate
ISS[8]	2011	215	systematic review	very serious[a,h]	not serious	not serious	very serious[g]	likely[i]	none	moderate
Vasconcelos[13]	2017	346	retrospective	very serious[j]	very serious[l]	serious[k]	not serious	undetected	events distribution does not consent a proper statistical analysis	very low
Eberlin KR[3]	2015	20	non-systematic review	very serious[a,c]	not serious	very serious[m]	very serious[g]	undetected	none	very low
Zapata- Copete J[11]	2017	5	meta-analysis	serious[e]	very serious[l]	not serious	not serious	undetected	none	moderate
Huang[9]	2015	12	meta-analysis	serious[c]	not serious	very serious[m]	not serious	undetected	none	low
Phillips[10]	2016	7	systematic review	serious[c]	serious[b]	very serious[k,m]	serious[d]	undetected	none	very low
Metcalfe[14]	2015	4	meta-analysis	serious[n,o]	not serious	not serious	not serious	undetected	none	moderate
AICPE[12]	2015	/	narrative review	very serious[a,c,f]	/	very serious[m]	very serious[g]	likely	absence of references does not consent critical analysis	very low
Robinson[25]	2019	22	experimental	very serious[n,o]	very serious[l]	not serious	serious[p]	undetected	none	very low

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Continued Table 4: Summary of findings and Grade of Evidence Rating

Included studies				Quality assessment						
First author	year	No. of studies/ subjects	Study design	Risk of bias	Imprecision	Inconsistency	Indirectness	Publication bias	Other considerations	Quality of evidence
Patel[23]	2012	1/16	case report / non-systematic review	very serious[a,c]	serious[b]	very serious[k,m]	serious[g]	undetected	none	very low
Herlin[24]	2016	41	systematic review	very serious[a,c]	serious[b]	very serious[k,m]	very serious[g]	undetected	none	very low
Yaffe[15]	2014	42	narrative review	very serious[a,c,f]	very serious[b]	very serious[k,m]	very serious[g]	likely	none	very low
Aryan[5]	2015	67	systematic review	very serious[a,f,q]	serious[r]	not serious	serious[s]	undetected	none	moderate
NICE[16]	2019	3	systematic review	serious[f]	serious[b]	serious[k]	not serious	undetected	none	moderate
Ramos[17]	2017	19	systematic review	very serious[c,e,j,n,o]	serious[b]	very serious[k,m]	not serious	undetected	none	very low
Barajas-Nava[18]	2013	35	systematic review	serious[n,o]	serious[b]	serious[m]	serious[s]	undetected	none	low
Avni[19]	2010	17	meta-analysis	serious[e,o]	serious[b,r]	serious[m]	serious[g,s]	undetected	none	low
Chahed[21]	2014	80	prospective	very serious[a,c,n,t]	not serious	very serious[k,m]	serious[g]	undetected	none	very low
Csenkey[20]	2019	6	meta-analysis	very serious[a,b,e]	serious[b]	serious[k]	serious[g]	likely	none	low

a. Search criteria ambiguous, no exclusion criteria declared
b. Some event estimate comes from small studies
c. Heterogeneity of studies not balanced with proper statistics
d. The study population overlaps with a subgroup of clinical patients
e. The number of studies was relatively small for some use of antibiotics
f. No sufficient evidence was identified to answer all of the key questions asked
g. Some recommendations refer to heterogeneous clinical scenarios
h. Some of the evidence has been evaluated through an earlier grading system
i. The study was supported by significant public funding
j. No patient randomization
k. Significant heterogeneity was detected in the overall analysis
l. No. of events is very low
m. Significant study selection bias
n. Allocation concealment bias
o. Blinding bias
p. Results are extrapolated from a small part of the population
q. Attrition bias
r. Large 95% CI, ranging from important reduction in SSI risk to important increase in SSI risk
s. Patients recruited in the 1960s and the 1980s, and may not reflect contemporary practice
Detection bias

Several studies have been performed to evaluate whether in breast surgery a single dose of antibiotic is sufficient or if a prolonged administration is necessary carrying up to 24 h: at the moment a definitive consensus lacks[11].

In a recent systematic review and meta-analysis, Zapata-Copete[12] suggests that the post-operative infection rates are higher in those patients not received prophylaxis: for this reason, prophylaxis in breast surgery should be indicated.

Aesthetics. For abdominoplasty, body lift, bottom lift, thigh lift, Brachioplasty and lipofilling procedures, SICPRE[1] guidelines do not indicate the use of antibiotics in case of clean surgery, while the Italian Society of Aesthetic Surgery (AICPE) suggests prophylaxis[13].

Concerning lipofilling procedures AICPE guidelines indicate prophylaxis only if a volume >150 cc of adipose tissue has been suctioned.

Head and neck. Antibiotics in this surgery field are under debate: according to SICPRE[1] guidelines none of these interventions need prophylaxis, Aryan[5] agrees in case of otoplasty, blepharoplasty and rhinoplasty.

Scottish guidelines[4] indicate antibiotics only in case of wide resections, lymph node dissection and rhinoplasty. In the ISS guidelines, antibiotics are prescribed with the exception in case of otoplasty.

Hand. With regards to antibiotic-prophylaxis in hand surgery, Vasconcelos et al.[14] study show no difference in SSI incidence after administration of prophylaxis or placebo in clean surgery that lasted less than 30 minutes.

The procedures that would not require antibiotic therapy are skin incision, soft tissue excision, suturing, and repairing of tearing of muscle, tendon, and fascia[5].

Prophylactic antibiotics are routinely administered to patients having soft tissue surgeries lasting longer than 2 h, when surgery involves the bone and implants, in case of debridement of devitalized wound tissue or animal or human bites.

When needing temporary ischemia of a limb, it is necessary to wait at least 5 min after intravenous administering completion to guarantee appropriate drug concentration at the surgical site before starting tourniquet application[3]. The SICPRE[1], Scottish[4] and ISS[8] guidelines agree on that praxis.

There was no reduction of infection rates if antibiotics are administered in the open distal phalanx fractures[15].

Trauma. If trauma occurs in an agricultural environment, the administration of broad-spectrum, empiric antibiotic therapy is recommended for high-grade, open injuries[16]. Administration of a first-generation cephalosporin (e.g., cefazolin 1-2 g administered intravenously every 8 h until 24 h after wound closure) will provide coverage against gram-positive organisms.

An aminoglycoside (e.g., gentamicin administered intravenously with the dose based on weight) or levofloxacin (500 mg administered every 24 h) is added to the regimen to provide coverage against gram-negative organisms.

The addition of ampicillin, penicillin, or doxycycline is recommended to address the risk of clostridial myonecrosis in the setting of agricultural injuries.

For the patient allergic to penicillin, a combination of vancomycin and a fluoroquinolone provides excellent coverage against gram-positive, gram-negative, and clostridial species.

If trauma occurs from human and animal bites, antibiotic prophylaxis is indicated for any bites broken the skin and caused bleeding or involves the hands, feet, skin overlying joints or skin overlying cartilaginous structures[17].

For other bites, that do not have the above-mentioned characteristics, can be anyway advisable to consider antibiotic prophylaxis, particularly if the person is at risk of serious wound infection.

This includes people with diabetes, asplenia, chronic liver disease, immunosuppression, heart valve disease, a prosthetic heart valve or joint, or someone very young or frail.

For animal bites gold standard therapy is co-amoxiclav 250/125 or 500/125 mg three times a day for three days; immediate tissue irrigation with saline solution is also recommended.

If penicillin allergy is suspected, the most effective alternatives are doxycycline 200 mg on the first day, then 100 or 200 mg daily for three days with metronidazole 400 mg three times a day for three days. Another alternative is azithromycin (in pregnancy) 500 mg once a day with metronidazole 400 mg three times a day for three days.

In the aforesaid cases, it is always recommended to consider anti-tetanus or anti-rabies prophylaxis.

Burns. In a systematic review[18] antibiotic prophylaxis during the early post-burn period would not have an indication, except when mechanical ventilation

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is necessary.

Barajas-Nava[19] suggests no routine administration of antibiotic prophylaxis for all burn patients: topical silver sulfadiazine is associated with a significant increase in rates of burn wound infections and increased length of hospital stay compared with dressings or skin substitutes.

The effect of other forms of antibiotic prophylaxis is currently unclear. Avni et al.[20] also suggest the need for more randomized controlled trials. Csenkey et al.[21] studies in pediatric burn patients did not define any subgroup that benefited from prophylaxis.

In line with them, Chahed et al.[22] indicate antibiotics only for therapy of confirmed infections.

Therefore, most of the scientific literature agrees on not administering antibiotic-prophylaxis in burns at emergency time, except when mechanical ventilation or skin-grafting procedures are needed.

Miscellaneous. When hirudotherapy is administered the most frequently used antibiotics are fluoroquinolones, third-generation cephalosporins and sulfamethoxazole/trimethoprim[23].

The most used antibiotic is ciprofloxacin, as suggested by Patel et al.[24] however, for the increased risk of ciprofloxacin resistance, the association with trimethoprim-sulfamethoxazole could be a satisfactory alternative (ciprofloxacin 500 mg 2/day and trimethoprim-sulfamethoxazole 800/160 mg 2/day)[25].

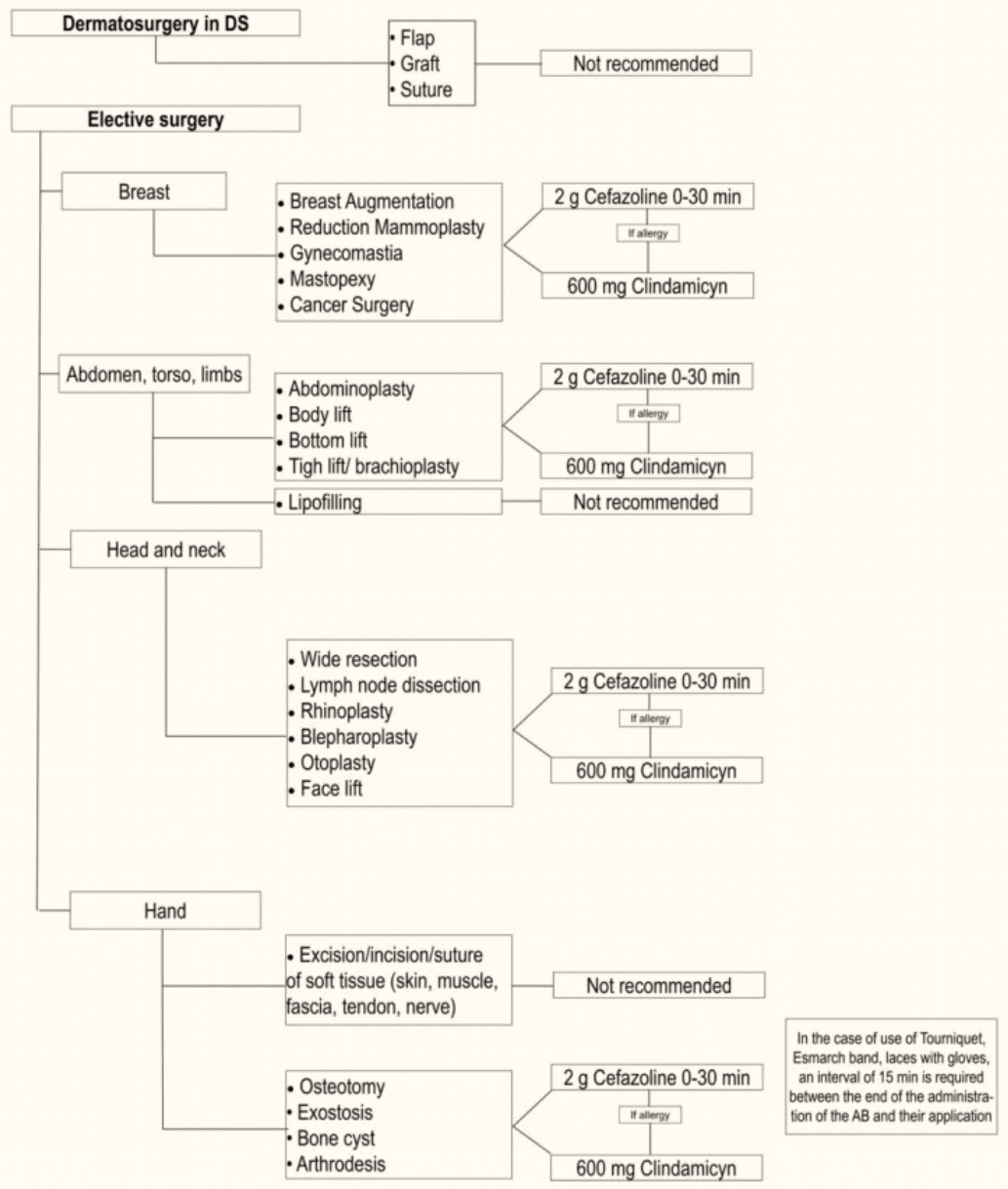


Fig. 2: Operative algorithm for antibiotic prophylaxis

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Prophylactic antibiotic treatment is recommended by most of the authors and should be prolonged up to 24 h after the hirudotherapy ends.

Robinson et al.[26] proposed other types of antibiotics for such treatment, however, a variable resistance has been demonstrated for ampicillin, ampicillin/sulbactam, meropenem, piperacillin/tazobactam and for cefazolin.

As suggested by SICPRE guidelines[1], in case of microsurgical transplantation, major skin cancer surgery or large flap harvest, regardless of anatomic site, prophylaxis should be prolonged up to 3 d after

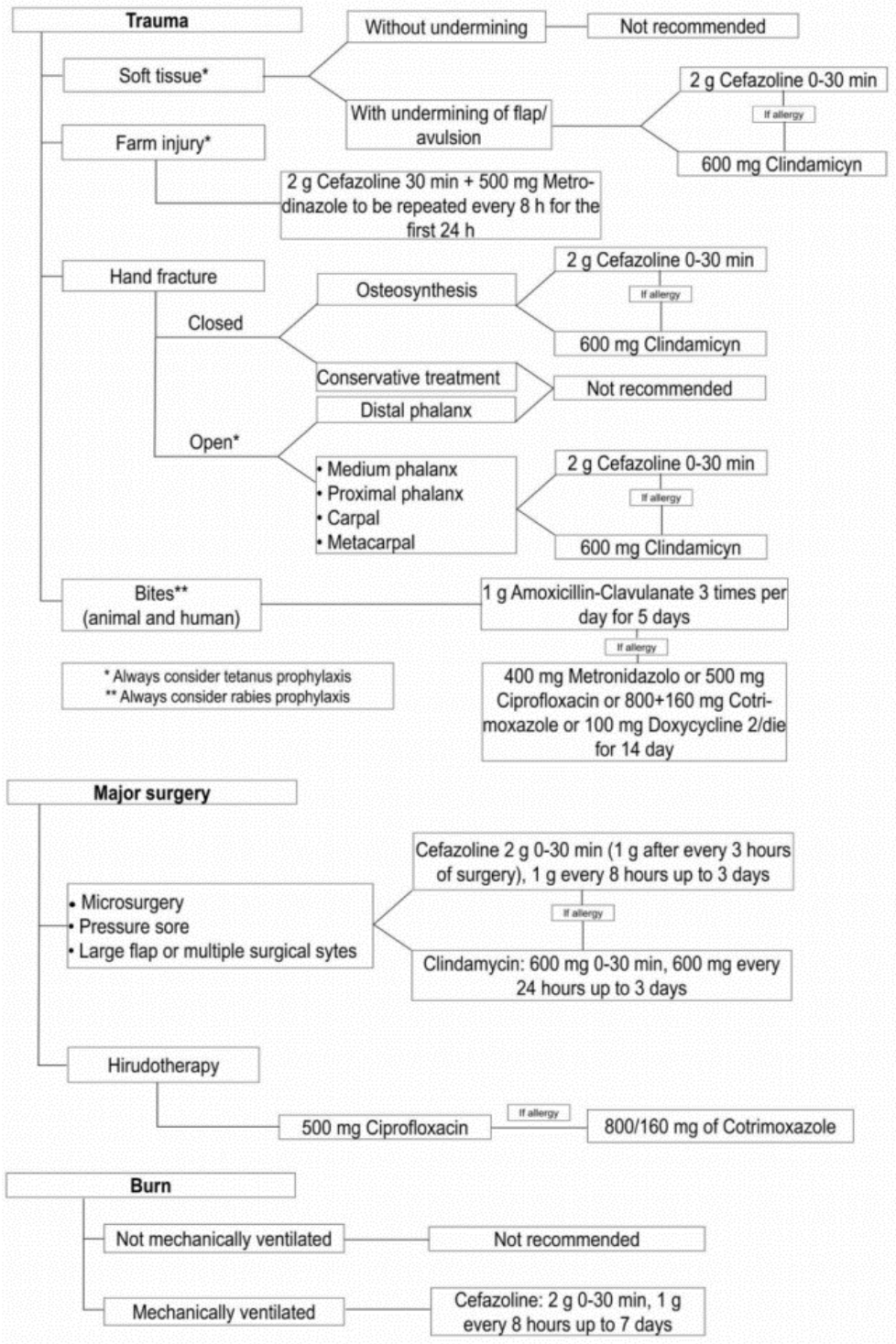


Fig. 3: Operative algorithm for antibiotic prophylaxis (cont'd)

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surgery in addition to the standard preoperative dose.

Operative algorithm

As a synthesis of the described results, we defined an operative algorithm to support surgeon decision-making in the most relevant procedures of plastic surgery (Figures 2 and 3).

DISCUSSION

Dealing with the most challenging problems in reconstruction is common in a tertiary university hospital and choosing the most effective antibiotic prophylaxis can be critical to optimizing surgical outcomes and reducing health costs.

However, a large team of consultants and resident surgeons may have some difficult to comply with the same standard of care. Consequently, an effective prevention tool has to be easy to use, if not, the risk of surgical site infections will increase due to misuse[27].

An elaborated algorithm for prophylaxis will be experienced by clinicians as somehow confusing and not attractive, causing inappropriate application or neglect. From this assumption, we moved to identify proper indications to prophylaxis and to harmonize as much as possible the antibiotic choices concerning different clinical scenarios.

The result is a protocol that connects one specific procedure with appropriate infection prevention, the route and timing of administering are also suggested.

Our effort was to include in the present review only reports with comparable design, thus providing uniform confidence grade. Unfortunately, there is a great methodologic discrepancy between literature data on that topic that undoubtedly represents a limit of the study.

The majority of procedures performed under local anesthesia do not require infection prevention, i.e. skin suture and small graft or flap can be safely be accomplished after adequate surface sterilization and surgical field preparation with sterile drapes[1,15].

Minor surgery in a contaminated field or the use of pins or bone screws are exceptions to the rule: routinely carried out under local or regional anesthesia but entailing a higher risk of SSI[3].

There is consensus on prevention in elective major procedures, which usually require general anesthesia due to wide undermining of tissues.

Antibiotic prophylaxis is always indicated, even if which drug has to be used is under debate and the dosing can vary from ultra-short to 3 days-protracted therapy[1]. Between different dose schedules, we selected ultra-short as the choice, because it's been proved to be effective and costs saving.

Extension of antibiotic administration after surgical incision seems to be of no use, half-life declines after 3 h, so only in prolonged procedures, a further administration seems necessary.

In any case, the drug plasmatic concentration has to be reached before surgery starts, even just ahead, but, in the case of tourniquet use, 15 min are needed to ensure proper concentration at the distal surgical site.

We reserve 3 days-prolonged prevention only in case of time-consuming surgery when more than one surgical site is involved or a wide exposure of deep anatomical structures occurs.

Lymph node dissection does not strictly represent an indication for prolonged prophylaxis, but poor metabolic and immunological conditions may render patients to be more prone to infections.

Despite several antibiotics are proven to be effective in prevention, some of them have to be reserved for therapy of multi-resistant strains, such as vancomycin and the fourth generation of cephalosporins[9].

Prevention in an elective, proper-set procedure does not justify the use of the sole drugs active against potentially lethal infections.

For the same reason, multi-therapy seems to be inappropriate, but when the SSI risk is high, as, after an animal bite or farm injury, a broad spectrum is necessary to contrast all pathogens may be present (*Pasteurella* spp., *Staphylococcus and Streptococcus* spp, *Capnocytophaga canimorsus, Porphyromonas, Bacteroides, Fusobacterium* spp, *Corynebacterium*)[16].

Extensive burns almost invariably require antibiotic therapy during hospitalization, but at the time of incident the thermal damage makes bacterial growth impossible, so only patients who need mechanical ventilation are subject to early systemic infections.

The use of leeches, in flap salvages procedure, needs definite antibiotic against pathogens resident in their secretion (*Aeromonas* spp. occurring in the intestine of *Hirudo verbana*)[24,25].

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CONCLUSION

A broad spectrum of procedures characterizes plastic surgery, differences don't rely only on technical details, but even depend on the involved body area, the patient's age, and conditions, and if implants are to be used.

It is arduous to try to synthesize a huge amount of reviews, experiences, and reports on infection prevention, each dedicated to a distinct branch of this wide surgical field.

To date, a comprehensive review that covers all plastic surgery fields is missing, but the high-demanding reconstructive issues, for which the SSI prevention is mandatory, require proper antibiotic use, which can't be established only on the surgeon's own experience.

After a throughout revision of the most recent literature, an effective, easy-to-use, operative protocol for antibiotic prophylaxis is provided.

FINANCIAL SUPPORTS OF THE STUDY

None.

CONFLICT OF INTEREST

None declared.

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