“Too much information with little meaning,” relevance of preoperative laboratory testing in elective oral and maxillofacial surgeries: A systematic integrative review

ABSTRACT

Aim: In the recent times due to accessibility of tools and advent of technology advising battery of laboratory tests prior to any elective surgical procedure has become a norm. This review aims at investigating relevance of such tests in healthy patients undergoing routine elective oral and maxillofacial surgical procedures.

Methods: Various search engines were thoroughly searched to identify relevant literature. The population of interest was asymptomatic adults above 18 years of age undergoing elective surgery.

Results: The preoperative tests of interest for the current study included complete blood count, coagulation tests, biochemistry, and chest X-rays. An algorithm for preoperative tests has been proposed.

Conclusion: We conclude that advising battery of routine tests in such patients leads to further delays and rise in overall cost of the surgery.

Keywords: Dentoalveolar, elective surgeries, guidelines for preoperative evaluations, maxillofacial surgeries, preanesthetic preparations, preoperative laboratory investigations

INTRODUCTION

Preoperative laboratory investigations are an important part of any surgical checklist. Surgeons, all over, recognize the significance of this step in optimizing their patients before the surgeries. Preanesthetic assessment of patients involves a thorough investigation through the history and clinical assessment along with physical examination. Laboratory investigations supplement this judgment. Advice of routine blood investigations for elective surgical procedures in clinically healthy patients is based on long-term perception that such tests aid in the detection of abnormal findings that are clinically concealed, which place patients at risk during surgery and delay postsurgical recovery, if left undetected. There is a lack of uniformity in the practice of advising preoperative tests. This could be due to poor awareness and implementation of guidelines world over.

A plenty of scientific literature concerning this subject is found in general surgery, yet such is not the case for Oral and Maxillofacial Surgery (OMFs). The conclusions are drawn for elective OMF surgeries from the general surgical guidelines on preoperative evaluation. Therefore, the main objectives of this review are to compile and appraise the available literature to understand the current perspective of the surgeons and anesthetists in preparing their patients for...
the elective OMF surgeries and suggest an algorithm for the selection of relevant preoperative laboratory tests.

METHODS

Literature search
Different search engines were used to compile the studies relevant to the topic under review. The databases MEDLINE, PubMed, ScienceDirect, Cochrane Database of Systematic Reviews, Wiley Online Library, and Google Scholar were thoroughly searched relevant systematic reviews, narrative reviews, guidelines, recommendations, studies, and abstracts. The keywords utilized for search were presurgical, preoperative laboratory investigations, preoperative test, evaluation, guidelines, preanesthetic preparations, elective surgeries, maxillofacial surgeries, and ASA categories. At first, search the keywords and their combinations were used, and then, the process was continued by selecting manually other relevant citations from the initial search. This process continued till sufficient literature was collected. Since this is a review without any participation of human or animal models, no ethical committee approval was required.

All the studies evaluating the current topic of investigation, irrespective of type of surgical specialization, were included. The criteria for exclusion were studies published before 1985, studies that did not report primary outcome data relevant to the current review, and studies that included investigations in co-morbidities. The entire search process was restricted to publications in English language. The literature that was included in the current review was recent reviews, guidelines, recommendations, and prospective and retrospective studies published in the time frame mentioned above. The population of interest was asymptomatic adults above 18 years of age undergoing elective surgery. The preoperative studies that were of interest for the current study included chiefly laboratory tests (complete blood count, coagulation tests, and biochemistry) and chest X-rays. Electrocardiogram (ECG) and echo were discussed briefly. Studies on pediatric patients were excluded.

RESULTS

One hundred and fifty research papers were found in the first search. Scientific literature relevant to the study was identified and segregated into following categories:

i. Guidelines: 4
ii. Reviews on preoperative tests in general elective surgery: 8
iii. Reviews on preoperative tests in OMF elective surgery: 2
iv. Prospective/retrospective studies on preoperative tests in general elective surgery: 34
v. Prospective/retrospective studies on preoperative tests in OMF elective surgery: 3

Total number of papers included: 51.

DISCUSSION

Preoperative laboratory investigations represent a special class of screening tests. The main purpose of these tests as mentioned earlier is to provide additional diagnostic and prognostic information to supplement the clinical history and assessment of a patient with the following aims:

• Evaluating the appropriateness of the ongoing course of clinical assessment and management
• Comprehensive risk evaluation of the patient due to general anesthesia
• Possibility of delay or cancellation of surgery due to unavailability of test results
• Establishing a baseline measurement for later reference
• Predicting intraoperative and postoperative complications
• Predicting risk due to unknown undiagnosed medically relevant conditions and medicolegal considerations.

Till the mid-nineties, clinicians evaluated patients preoperatively. Based on thorough history and physical examination, only selective laboratory tests were ordered to support or negate the clinical findings. However, with change in times and better patient awareness of their rights along with advent of automation in clinical laboratories, injudicious ordering of scores of tests has gained support among physicians and surgeons. The practice of unscrupulously advising laboratory tests before elective surgical procedures lacks concrete scientific evidence. There is very little scientific literature supporting relevance of these tests in terms of clinical utility in apparently healthy individuals (American Society of Anesthesiologists [ASA] 1 and 2) before the surgical procedure. The Practice Advisory released by Task Force of the ASA in 2002 that updated again in 2012 clearly mentions ordering of preoperative laboratory tests be preceded by complete evaluation of patients medical records, patient interview, and physical examination along with the type and degree of invasiveness of the procedure proposed. In 2003, the National Institute for Health and Care Excellence released guidelines based on systematic review conducted by Munro et al., which were revised and updated again in 2016. The guidelines for preoperative tests were based on specific type of surgery and ASA grade. Preoperative tests such as full blood count, hemostasis, kidney function tests, and ECG are not routinely recommended in minor to intermediate surgeries in ASA 1 and 2 patients. The guidelines provide recommendations...
The literature searches highlighted a systematic review by Munro et al. which clearly mentions the counter-productiveness of various tests of hemostasis. Routine bleeding time (BT), prothrombin time (PT), and partial thromboplastin time (PTT) in clinically healthy patients have shown abnormality in various ranges (3.8% for BT, 4.8% for PT, and 15.6% for PTT). Regardless of abnormal findings, management remained unchanged in most surgical procedures. Similar observations were made with regard to blood electrolytes, renal function tests, and blood glucose (biochemistry) in other significant systematic reviews [Table 1] and studies [Table 2]. Another systematic review by Czoski-Murray et al. deals with some pertinent questions on clinical effectiveness and cost-effectiveness of the routine preoperative laboratory tests in ASA 1 and 2 patients, undergoing minor to intermediate elective surgery. In their systematic review, made comparable conclusions from other high-quality studies stating the lack of evidence supporting routine preoperative testing in otherwise healthy adult patients. They also recommend need for large-scale multicenter random clinical trials to explore clinical effectiveness of preoperative testing compared to no testing in patients with low-risk elective surgeries, for more conclusive statements.

Among the conventional diagnostic tests, ECG, X-ray, CBC and coagulation tests, biochemical blood tests, and tests related to the renal system are common. There is no good evidence that abnormal preoperative test results of X-ray, ECG, CBC, hemostasis, electrolytes, creatinine, and urinalysis abnormalities rarely lead to change in clinical management of patients. There is no good evidence that abnormal preoperative test results of urine analysis accurately or significantly contribute to the overall patient management.

The authors of the current review are also of the same opinion, as more systematic research would be helpful in better evidence-based policy-making for clinicians and hospitals. In a retrospective study conducted on 2000 patients undergoing elective surgery, Kaplan et al. concluded that 60% of routinely ordered tests could be avoided if the clinician relied on the history and examination, since only 0.22% of these revealed abnormalities that may have led to a change in the perioperative management of the patient. Contrary to this, the study by Correll et al. and others have concluded that preoperative evaluation along with laboratory tests can aid in identification and resolving of underlying unknown medical issues that can have positive effect on the overall patient management, but tests should be requested judiciously as shown in Table 2.

A detailed evaluation of patients undergoing OMF procedures follows the same principles as for any other surgical procedure elsewhere in the body. Wagner and Moore published a comprehensive review on the relevance of preoperative testing in OMF surgeries. The article discusses the WHO criteria, which emphasizes on the evaluation of overall general condition of the patient before advising the laboratory tests. The advised test should have clear indication in terms of morbidity and mortality and at the same time should have significant impact on the overall management of the patient. The review discusses limitations of laboratory tests in terms of its sensitivity and specificity and their inability to detect the underlying abnormalities (false negative) accurately or

| Author                     | Preoperative tests                                                                 | Conclusions                                                                 |
|----------------------------|------------------------------------------------------------------------------------|-----------------------------------------------------------------------------|
| Wagner and Moore, 1991     | ECG, X-ray, CBC, Hb and coagulation tests, LFTs, RFTs, TFTs, and urine analysis   | Preoperative test results of abnormalities had no influence on the clinical management of patients |
| Munro et al., 1997         | ECG, X-ray, CBC and coagulation tests, biochemistry, and urine analysis             | There is no good evidence that abnormal preoperative test results of X-ray, ECG, CBC, hemostasis, electrolytes, creatinine, and urinalysis abnormalities rarely lead to change in clinical management of patients |
| Fattahi, 2006              | CBC, platelet, WBC, Hb, coagulation tests, blood glucose, LFTs, RFTs, pregnancy test, and urine analysis | Clinically relevant conditions are recognized during the history and physical examination without the need for further laboratory testing |
| Kumar and Srivastava, 2011 | ECG, X-ray, CBC and coagulation tests, serum creatinine, electrolytes and blood glucose | Performing routine tests in all surgical patients as a screening tool is of little value and expensive |
| Czoski-Murray et al., 2012 | FBC, electrolytes, renal function and pulmonary function in adult patients classified as ASA 1 and 2 undergoing elective Grade 1 or Grade 2 surgical procedures | Absence of published evidence supporting routine use of these tests in patients falling in ASA 1 and 2 |
| Keay et al., 2012          | Preoperative testing (ECG, X-ray, CBC, and various serum parameters)               | Routine preoperative testing was not found to increase the safety of a patient undergoing cataract surgery |
| Johansson et al., 2013     | Preoperative renal function tests, urine analysis, electrolyte tests, liver function testing, and pregnancy testing, blood gases, Hb and hematocrit testing. Pulmonary evaluation: Spirometry, and chest X-ray | No evidence available from high-quality studies that supports routine preoperative testing in healthy adults undergoing noncardiac surgery |
| Balk et al., Agency for Health Care Research and Quality, 2014 | Preoperative testing (ECG, X-ray, CBC, coagulation tests, metabolic panels, and urine analysis) | Large RCTs required for better evidence and conclusion |

ECG: Electrocardiogram, CBC: Complete blood count, Hb: Hemoglobin, RFTs: Renal function tests, LFTs: Liver function tests, WBC: White blood cell, FBC: Full blood count, ASA: American Society of Anesthesiologist, RCTs: Randomized controlled trial, TFTs: Thyroid function tests

Table 1: Systematic reviews assessing routine laboratory investigations in preoperative evaluation
This prospective study on ASA 1-4 patients showed that preoperative test is not negligent provided that the request matches with the patient’s clinical features.

This prospective study on ASA 1 and 2 patients of cholecystectomy showed that preoperative tests provided little information that could not be obtained by history and physical examination that would alter management in otherwise healthy patients undergoing surgery.

This retrospective study showed that, outcome could not be predicted by routine tests, anesthesia rarely altered, high cost.

In conclusion, this retrospective study showed in ASA 1 and 2 patients that certain unindicated tests are requested due to lack of conclusive evidence, and so, there is an urgent need for developing guidelines for preoperative tests in Indian context.

This prospective, cross-sectional study on ASA 1-4 patients undergoing elective surgery showed that lot of laboratory investigations requested for patients undergoing surgery at their hospital had no clinical indication.

b. Studies having views that support routine preoperative tests

This retrospective, multicenter study on ASA 1-3 patients showed that selective and rational preoperative tests were needed and routine tests were of little value.

This retrospective study concludes that an increase in the quality of perioperative care as a result of a reduction of cancelled surgery, hospital admission time, and operating room resource use.

This prospective study on ASA 1 surgery patients concluded that, preoperative tests should be ordered judiciously by anaesthetists supplemented by physical examination and history.

c. Studies on routine preoperative tests in oral and maxillofacial surgery

This prospective study on patients undergoing routine dentoalveolar surgery concluded that a good history and physical examination and then reassessment were sufficient to plan the surgery and anaesthetic treatment.

This is a retrospective study highlighting the absence of clear guidelines for preoperative tests.

CBC: Complete blood count, PT: Prothrombin time, PTT: Partial thromboplastin time, BT: Bleeding time, Hb: Hemoglobin, ECG: Electrocardiogram, FBG: Fasting blood glucose, RFTs: Renal function tests, LFTs: Liver function tests, ASA: American Society of Anesthesiologists, CT: Clotting time, ENT: Ear, nose and throat.

Criteria for advising preoperative tests. Although age remains an independent factor in decision-making process, the other factors are ASA status and type of surgical procedure. As observed by Munro et al routine preoperative tests are not competent in anticipating postoperative outcomes in asymptomatic patients, raising caution by false-positive results; this contributes to additional cost and discomfort to the patient.
except in certain well-defined groups such as patients beyond a certain age.\textsuperscript{[34]} Similar observations have been reported by other authors in context to OMF surgery.\textsuperscript{[2,50,51]} As observed by Wagner and Moore, majority of procedures performed by OMF surgeon fall into ASA 1 and 2 categories, most of whom are young.\textsuperscript{[7]} Keeping these observations in mind, authors of the current review suggest a working algorithm (utilizing the classification of surgical procedures in maxillofacial spectrum) proposed by the authors that incorporates the ASA category, type of surgical procedure, and age of the patient as essential criteria for the selection of preoperative laboratory tests [Figure 1 and Table 3]. The proposed algorithm and table are recommendations in the form of screening tool for choosing appropriate preoperative laboratory tests; the authors suggest further studies to substantiate clinical validity of the same.

**CONCLUSION**

By ordering battery of tests before surgeries, anesthetists and clinicians generate ample information about the current status of the patient. This information in authors’ view, which is substantiated by present review, has limited influence on the overall management and outcome of elective maxillofacial surgical patients. Guidelines are now in place and emphasize careful selection of preoperative laboratory tests based on personalized case. In authors’ observation, excessive data generated through unmindful “one for all, all for one” attitude of clinicians need immediate shift, as this leads to unnecessary procedural delay, lack of overall patient satisfaction and trust.
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Conflicts of interest
There are no conflicts of interest.

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