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12

Impact of alcohol & smoking on the surgical management of gastrointestinal patients

Niall D. Kennedy*, Des C. Winter

St Vincents University Hospital, Elm Park, Dublin 4, Ireland

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ABSTRACT

Alcohol and smoking are repeatedly described as modifiable risk factors in clinical studies across all surgical specialities. These lifestyle choices impart a sub-optimal physiology via multiple processes and play an important role in the surgical management of the gastrointestinal patient. Cessation is imperative to optimise the patient's fitness for surgery with surgery itself being a prime opportunity for sustained cessation. A consistent, planned and integrated management involving surgical, anaesthetic, medical, and primary care facets will aid in successful cessation and perioperative care. This review highlights the pathological processes which contribute to perioperative complications and details the current practices to detect, predict and appropriately manage the perioperative gastrointestinal patient who smokes and consumes alcohol.

Optimising gastroenterology patients for surgical procedures will require the employment of general and specific tactics combined with the ever important practice of careful patient and procedure selection [1]. Hazardous lifestyle factors such as smoking and alcohol intake have strongly linked effects on postoperative complication rates [2,3]. The typical scenarios of gastrointestinal patients presenting for surgery may be elective or emergency cases. The general approach to optimising patient health preoperatively will include detection, management and ideally cessation of alcohol and smoking usage preoperatively. Elective patients who smoke or use alcohol can be identified and treated upon the initial clinic encounter or preoperative assessment clinics. This process is difficult to achieve in the emergency setting. Because of this all patients should be encouraged to achieve cessation at each clinic encounter.

1. Alcohol

Excess alcohol consumption can affect all systems of the body contributing to psychiatric and physical complications which should be considered preoperatively to limit complications. Chronic hazardous alcohol intake can raise complication rates by 50% with daily consumption of 4.5–6 units (3–4 standard US drink measures) equating to 36–48 g of alcohol. In excess of 7.5 units daily or 60 g increases risks even further by over 200% [4–7]. Alcohol misuse or hazardous drinking ranges from 7 to 49% in elective surgical patients and 14–38% in emergency cases [8]. High alcohol consumption is associated with increased postoperative mortality (RR = 2.68; 95% CI: 1.50–4.78) [2].

1.1. Preoperative screening & stratification

Risk scoring systems in the preoperative setting help to identify those requiring intensive preoperative preparation, those requiring enhancements to perioperative care and indeed detecting those at risk of alcoholic liver disease in the first instance. To help with screening preoperative assessment clinics should employ screening questionnaires such as the Alcohol Use Disorder Identification test (AUDIT) as part of their interview, history and physical exam with special attention to cardiac and respiratory systems [9].

Further stratification of risk is based on investigatory tests undertaken and driven by the initial clinical suspicion or patients' discussion of alcoholism. Chest x-ray, electrocardiogram and blood panels inclusive of blood counts, biochemistry and coagulation profile assessing synthetic function of the liver, may be applicable. The Child-Pugh score was developed to determine the operative

* Corresponding author. Department of Surgery, St Vincent's University Hospital, Elm Park, Dublin 4, Ireland.
E-mail address: nllkennedy@gmail.com (N.D. Kennedy).

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risk in patients undergoing portosystemic shunt surgery for variceal bleeding [10]. Current versions are used in the assessment of progression/severity of chronic liver disease. The more recent Model of End-stage Liver Disease (MELD) was initially developed to predict the survival of patients undergoing transjugular intrahepatic portosystemic shunt (TIPS) [11]. Currently MELD is widely used to rank the priority of liver transplantation but may be used to assess prognosis in cirrhotic patients [12]. The specific application of each has not yet been determined fully for surgical patients undergoing liver resection although a study of 587 patients showed benefits of the combined use of the Child-Pugh and American society of Anaesthesiology classification [13]. Prognostic findings are similar thus a combined use of scores may be optimal in some cases [14].

1.2. Intraoperative issues

Intraoperative issues of excess alcohol intake to be considered include the patients' physiological response to surgery and interactions with anaesthesia or other intraoperative medications. Induction of anaesthesia compromises the cardiovascular system which may be suboptimal due to alcoholism. The risk lies with alcoholic driven cardiomyopathy (hence decreased ejection fraction), increased endocardial ischaemia and arrhythmias [9,15–17]. The physiological stress response to surgery is a systemic reaction which commences at initial incision and is increased in chronic alcohol consumers as highlighted in a number of significant systematic reviews [18]. Over-activation of the hypothalamic-pituitary-adrenal axis to result in excess serum cortisol, adrenaline and noradrenaline and thus increased heart rate and variability and also increased blood pressure [19–21].

A requirement for the use of higher dose anaesthesia is another issue with alcoholism. An increased dosage of propofol (31% more) is required in patients who consume in excess of 5 units (>40 g) of alcohol per day [22]. The increased dose is significant as it will cause well-recognised side effects of propofol administration such as hypotension, vasodilation decreased systemic vascular resistance and decreased myocardial blood flow, all of which may lead to intraoperative haemodynamic complications [23–25]. Along with a recommendation of altered dosing at induction of anaesthesia, rapid sequence induction should be considered in acute intoxication to avoid aspiration [26,27].

Higher dosing of fentanyl is also required amongst alcohol dependent patients where the risk of more prolonged respiratory depression is already a problem [28–30]. In terms of alcohol cessation, excess alcohol consumers with subclinical cardiac dysfunction can recover function by abstinence in a surprisingly short amount of time (4 weeks) [31,32]. Appropriate responses to surgical stress may be reclaimed with at least 4 weeks of abstinence [21,32,33].

1.3. Perioperative considerations and postoperative complications

Postoperative complications are doubled amongst patients who consume over 3units or 24 g of alcohol per day [34]. The most common postoperative complications amongst chronic excessive alcohol consumers include infections, wound breakdown, cardiac ischaemia and arrhythmias [20,35–37]. Surgical site infections and wound breakdown is increased amongst alcohol consumers (RR = 1.23; 95% CI: 1.09–1.40) due to immune suppression and suppression of delayed type hypersensitivity [8,24,38,39]. The suppression of delayed type hypersensitivity has been shown to return to normality with 2–8 weeks of abstinence with a significant improvement at 4 weeks [40].

Alcohol is recognised as influential in haemostasis and excessive consumers are prone to increased perioperative and postoperative bleeding due to bone marrow toxicity, decreased fibrinogen, factor VII and vonWillebrand Factor [20,36,41]. Anaemia driven by alcoholism will further exacerbate the effects of surgical or traumatic blood loss perioperatively [42–44]. Of course the postoperative complications above are multifactorial and the lifestyle of excessive alcohol consumption contributes to overall poorer health conditions and malnutrition [45,46]. Thiamine, folate, magnesium, calcium (secondary to hypomagnesaemia) and phosphate deficiency should be identified preoperatively. Ketoacidosis and lactic acidosis is common with alcoholism as is rhabdomyolysis and pancreatitis [47,48].

One of the most significant complications to be considered in the postoperative period of gastrointestinal surgical patients is the risk of anastomotic leak. Although anastomotic leak is a multifactorial complication, alcohol intake has been associated with increased rates [37,49–51]. The general complications which alcoholism imparts will effect healing tissues and thus anastomotic integrity [52]. Of the responsible factors in the interplay causing anastomotic leak, subclinical cardiac dysfunction, immunosuppression, haemostasis and malnutrition (anaemia, hypoproteinaemia, and electrolyte imbalances) will contribute significantly to breakdown and thus will complicate management [53–56].

Delirium is a problematic post-operative complication which may be enhanced by alcohol withdrawals [57]. This is especially applicable in the acute surgical patient with a chronic excess alcohol consumption prior to admission and acute withdrawal secondary to perioperative fasting. Thiamine deficiency (Vitamin B1) can lead to Wernicke's encephalopathy presenting as encephalopathy, opthalmoplegia and ataxia (only present as a triad in 10%) and may progress if untreated to irreversible Korsacoff's psychosis [48].

1.4. Alcoholic liver disease and anaesthesia

Anaesthesia practices should be chosen carefully in terms of compounds used, monitoring and method of induction. Alcohol acts on serotonin, *N*-methyl D-aspartate (NMDA), glycine and GABA receptors to depress the central nervous system [58].

Traditional volatile anaesthetic compounds such as halothane reduce hepatic blood flow which may be detrimental in an already compromised liver [59,60]. Halothane clearance is decreased in liver dysfunction. The newer volatile anaesthetics utilised such as Isoflurane and Sevoflurane are metabolised to the more harmful derivatives of halothane however to a lesser degree and thus are less reactive causing less hepatotoxicity [61]. As discussed previously, propofol dosing requirement will be increased amongst chronic abusers. Opioids such as morphine, pethidine and fentanyl undergo decreased metabolism in chronic alcoholism and accumulate with repeat dosing [62].(see Tables 1 and 2)

The anaesthetic care of the patients with alcoholic liver disease should also focus on the complications of the alcoholism itself anticipating the presence of alcoholic cardiomyopathy [63,64], electrolyte imbalance such as hyponatraemia [65] and renal dysfunction [66–68] among other complications. Because of this, preoperative screening and optimisation is paramount however where not possible amongst the acute surgical patient, adequate monitoring and management is essential. Considerations should be made for invasive haemodynamic monitoring and sampling with the use of an arterial line.

1.5. Alcoholic liver disease and surgery

Although alcohol, smoking and the liver disease patient will be