IN BRIEF

- Patients with potential for bleeding are common in dental practice.
- Management of patients with acquired bleeding disorders begins with a careful medical and drug history.
- Significant postoperative bleeding due to medications is rare in dentistry.
- Altering a patient's anticoagulant medication often puts them at increased risk of morbidity and mortality.
- Almost all patients taking anticoagulants can receive dental care in the community setting.

VERIFIABLE CPD PAPER

Dental management considerations for the patient with an acquired coagulopathy. Part 2: Coagulopathies from drugs

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Dental patients often give a medical history that suggests the possibility of a coagulopathy from drugs, with a corresponding risk for prolonged bleeding during and following an invasive procedure. Identification of patients who may be prone to oral bleeding requires specific medical history information and the proper use of laboratory tests. Some NSAIDs are reported to cause prolonged oral bleeding, but scientific evidence is lacking. Likewise, the risk of oral bleeding from anticoagulants such as warfarin is often over stated, and unnecessary adjustment of NSAID or warfarin dosage puts patients at risk for significant morbidity and mortality. Some commonly employed laboratory tests such as the prothrombin time provide helpful information when used in the appropriate setting, but others, such as the bleeding time test, provide little or no predictive value in the determination of patients at risk for oral bleeding. Dental management of patients with potential coagulopathies from medications requires an understanding of basic principles of coagulation. The vast majority of these patients can be managed in the community setting without risk and without alteration of anticoagulant drug regimes.

An increasing number of dental patients are taking drugs which interfere with haemostasis, and there is concern that they might have prolonged bleeding during or following an invasive dental procedure. Although complete coverage of this subject would include both inherited and acquired coagulopathies, only acquired coagulopathies from medications are addressed in this paper. Acquired coagulopathies from systemic disease are covered in a companion article. (Lockhart *et al., Br Dent J* 2003; **195:** 439-445)

Clinically significant bleeding is an unusual if not rare event in dental practice, even for patients known to be at risk. A review of the medical and dental literature revealed only ten reports of excessive bleeding due to drugs following dental procedures, primarily from the use of warfarin at a time before standardisation of the prothrombin time test used to measure the effectiveness of this drug.[1,2] Other reports of prolonged bleeding suggest local factors (eg spitting, smoking) as underlying causes.

The management of a patient at risk for bleeding from medications such as warfarin or aspirin involves careful medical history-taking, consideration of specific laboratory tests and perhaps a discussion with the patient's physician. The dental practitioner must weigh the risk of clinically significant bleeding from an invasive procedure against the risks associated with an alteration in medical management, such as reducing the dose of an anticoagulant. Specific adjustments in dental management are often proposed for a given clinical scenario, usually based on established community standards or clinical guidelines. However, these management guidelines are often based on opinion, case reports, and clinical dogma, rather than clinical research data.[3] Recent UK guidelines have taken a stand on the issue of patients using warfarin.[4] This paper summarises the dental practice implications for acquired coagulopathies from drugs, based on the literature and official guidelines.

PATIENT EVALUATION AND MANAGEMENT

History taking

Standard medical history questionnaires should be used to gather preliminary information as a starting point for a more detailed questioning about specific medications known or reported to interfere

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Table I Medications that may interfere with haemostasis[47]

Aspirin and Aspirin-Containing Compounds

Alka-Seltzer® (aspirin)
Alka-Seltzer® XS (aspirin, caffeine, paracetamol),
Anadin® (aspirin, caffeine),
Anadin Extra®, Anadin Extra Soluble® (both aspirin, caffeine, paracetamol),
Anadin Maximum Strength® (aspirin, caffeine)
Asasantin ® Retard (aspirin & dipyridamole)
Askit® (aspirin, aloxiprin, caffeine),
Aspav ® (aspirin & papaveretum)
Aspro Clear® (aspirin)
Maximum Strength Aspro Clear® (aspirin),
Caprin® (aspirin),
Co-codaprin (aspirin & codeine phosphate)
Codis 500® (aspirin, codeine),
Mrs. Cullen's® (aspirin)
Disprin®, Disprin CV®, Disprin Direct® (all aspirin),
Disprin Extra® (aspirin, paracetamol),
Dristan Tablets® (aspirin, caffeine, chlorphenamine, phenylephrine)
Imazin ® XL (aspirin & isosorbide mononitrate)
MigraMax ® (aspirin & metoclopramide hydrochloride)
Nurse Sykes' Powders® (aspirin, caffeine, paracetamol)
Phensic® (aspirin, caffeine)
Veganin® (aspirin, paracetamol, codeine)

Other Non-steroidal Anti-inflammatory Drugs (NSAIDs)

aceclofenac
azapropazone
celecoxib
diclofenac
diflunisal
etodolac
fenbufen
fenoprofen
flurbiprofen
ibuprofen
indometacin
ketoprofen
ketorolac
mefenamic acid
meloxicam
nabumetone
naproxen
phenylbutazone
piroxicam
rofecoxib
sulindac
tenoxicam
tiaprofenic acid
tolfenamic acid

Antibiotics/Antifungals

aztreonam
cephalosporins (2nd + 3rd generation)
erythromycin (U)
fluconazole (U)
imipenem
isoniazide
ketoconazole (U)
meropenem
metronidazole (PC)
miconazole
penicillins (eg amoxicillin) (PH)
piperacillin
rifampicin
sulphonamides
tetracyclines
ticarcillin
trimethoprim (PC)

Other Medications

alteplase
amiodarone (PC)
anabolic steroids (U)
barbiturates (I)
carbamazepine (I)
chloral hydrate
cholestyramine (I)
chronic alcohol use (I)
cimetidine (PC)
corticosteroids
dipyridamole
disulfiram (PC)
heparin
omeprazole (P)
paracetamol
phenytoin (U)
quinidine
sucralfate (I) (U)
tamoxifen (U)
vitamin E (megadose) (U)
warfarin

Legends

PC = Potentiate the anticoagulant effect of warfarin levels by inhibiting metabolic clearance
PH = Potentiate hemorrhagic effect of warfarin without influencing its anticoagulant effect
I = Inhibit the anticoagulant effect of warfarin (impair absorption or increase its metabolism)
U = Mechanisms unknown or not established
P = Interfere with platelet function

with haemostasis (Table 1). The specific drug, dose, route of administration, and duration of use should be recorded for each medication. The dental surgeon should take the time to read about each drug and its effects from the BNF or similar publications.

Laboratory testing

Several laboratory tests are commonly used to evaluate haemostasis prior to invasive procedures, but some of the common tests (eg bleeding time, prothrombin time) are of little or no value for medication-related bleeding. Appropriate tests for acquired coagulopathies from medications include a platelet count for patients on cancer chemotherapy, International Normalised Ratio (INR) for patients taking warfarin, and partial thromboplastin time (PTT) for patients on heparin (Table 2). What follows is a discussion of the more common coagulopathies from medications, along with the appropriate laboratory test(s) and considerations for dental management.

COAGULOPATHY AS A CONSEQUENCE OF MEDICATIONS:

Aspirin, other non-steroidal anti-inflammatory drugs, and dipyridamole

When vascular endothelial cells are damaged, platelets bind to exposed collagen via glycoprotein receptors complexed to Von Willebrand factor. These platelets degranulate, releasing ADP and other substances (eg thromboxane A_2, serotonin, epinephrine) that are important in the platelet aggregation process. Since platelets have an important role in coagulation and, in particular, arterial thrombosis, antiplatelet drugs are in widespread use for the prevention of morbidity and mortality from vascular disease. Aspirin has been found to be effective in the prophylaxis of angina, acute myocardial infarction, transient ischaemic attack and stroke, atrial fibrillation, and prevention of clots around prosthetic heart valves. Aspirin, an ingredient of many prescription and over-the-counter drugs (Table 1), has weak antiplatelet activity through acetylating and irreversibly inactivating the enzyme cyclo-oxygenase, which prevents the conversion of arachidonic acid to thromboxane A, the prostaglandin required to stimulate platelet activation and aggregation.[5–10] Platelet inhibition by aspirin begins at about 1 hour following ingestion, and it is irreversible, lasting for the lifetime of the affected platelets (around 7–10 days).[5,9] It has been shown that as little as 80 mg of aspirin will have this effect on all existing platelets, and it is unclear if larger doses or pro-

Table 2 Laboratory tests used for evaluation of coagulopathies from drugs

Test	Purpose	Normal range
Bleeding Time (BT)	Platelet function	2–7 minutes
International Normalised Ratio (INR)	Measure of extrinsic clotting cascade (eg warfarin)	1.0
Partial Thromboplastin Time (PTT)	Measure of intrinsic clotting cascade (eg heparin)	25–35 seconds
Platelet Count (Full Blood Count)	Quantitative (eg cancer chemotherapy)	150–450,000/μL

longed usage will have a greater effect.[5,11] Aspirin, therefore, has its impact on platelet function. The platelet count, or measure of the number of platelets in the systemic circulation, gives no information concerning their viability or functionality. Although some medications (eg cancer chemotherapy) and some diseases (eg alcoholism) can cause bone marrow suppression and a lowered platelet count, this is an unusual situation in community dental practice. Therefore, the platelet count (via the full blood count) has no purpose in the preoperative evaluation of otherwise healthy patients taking non-steroidal anti-inflammatory drugs.

The bleeding time (BT) test has long been thought to predict the degree of interference from aspirin on platelet function, and therefore on bleeding during and following an invasive dental procedure. Although aspirin has been shown to increase the BT, and one study showed an increase in perisurgical blood loss in patients taking aspirin,[12] the literature suggests overwhelmingly that prolonged BTs do not translate into increased blood loss from surgery.[5,11,13–20] For example, O'Laughlin *et al.,* showed that while standard forearm BTs were elevated in patients taking aspirin, a BT done at the surgical site during liver biopsy was unchanged.[21] Because of the nonspecific nature of this test, it should be used only when the medical history identifies a specific reason for doing so.[22]

Non-aspirin NSAIDs, such as ibuprofen, are known to reduce the production of thromboxane A2 and interfere with platelet aggregation[23] and have been reported to cause bleeding in patients taking oral anticoagulants (eg warfarin).[24,25] Unlike aspirin, the antiplatelet effect is reversible, since the function of platelet cyclo-oxygenase (COX-1) is restored as the drugs are cleared from the circulation. However, different NSAIDs cause a varied extent and duration of platelet inhibition ranging from 1 to 3 days after discontinuing the drug.[26] The effect of NSAIDs on BT is variable, but BT test values usually return to normal within several hours of a single dose. Aspirin is reported to cause surgical bleeding complications in the general, orthopaedic, and cardiac surgery arenas, but this is of questionable significance in the dental setting. However, care must also be exercised with the use of aspirin in patients taking warfarin,[27] and with the use of non-aspirin NSAIDs in elderly patients and those taking aspirin for cardiovascular disease.[25,28] In addition, a recent study suggests that the pre-treatment of patients taking low dose aspirin for its cardioprotective effects with ibuprofen blocks the inhibition of platelet cyclooxygenase-1 activity and therefore the anti-platelet activity of aspirin.[28]

Dipyridamole, a more potent anti-platelet drug than aspirin, is currently used as an adjunct therapy to reduce the risk of thrombotic stroke in patients who have failed or who cannot take aspirin, and for those with prosthetic heart valves. This drug affects platelet function by inhibiting the binding of ADP to platelet fibrinogen receptor (glycoprotein IIb-IIIa) and subsequent platelet aggregation.[29]

Other analgesics — COX-2 inhibitors and paracetamol

The recent introduction of cyclo-oxygenase-2, or COX-2 inhibitors offers an alternative analgesic to NSAIDs for postoperative pain in dental practice.[30] This class of drugs also inhibits the activity of cyclo-oxygenase, which mediates the conversion of arachidonic acid to prostaglandins involved in the inflammatory process. Because they lack COX-1 activity, the likelihood of gastrointestinal upset should be lessened, and they are unlikely to have an adverse effect on platelet function. Although clinical research data are lacking, studies using laboratory values as outcomes suggest that COX-2 inhibitors have no effect on platelet aggregation, in contrast to aspirin and non-aspirin NSAIDs. This suggests that COX-2 inhibitors are unlikely to increase bleeding time following invasive dental procedures, although there are no prospective studies in humans.[31,32]

Although it is well established that paracetamol has little or no effect on platelet function, there have been several reports of an increase of the INR value in patients taking this drug along with warfarin.[33–36] Care must also be exercised with the use of paracetamol in patients with liver disease.

DENTAL MANAGEMENT CONSIDERATIONS FOR PATIENTS TAKING ANALGESICS

A common community standard for patients who have taken aspirin within the past week is to stop the use of any aspirin-containing medications and to delay invasive dental procedures for upwards of 5 days, with the understanding that 50% of the functional platelet population will be restored in that time period.[11] The potential problems associated with this practice include a postponement of urgent treatment and, more importantly, a decrease in the cardiovascular benefit of aspirin when prescribed for its antithrombotic properties.[15,37,38] A search of the literature failed to uncover a well documented case in which clinically significant bleeding followed tooth extraction in a patient receiving aspirin. Therefore, there is insufficient evidence to support the practice of altering aspirin therapy prior to dental surgery. This would apply to non-aspirin NSAIDs as well, but it is unclear if this applies to other platelet inhibiting drugs such as dipyridamole.[39]

Warfarin

Since well over a million people in the United States are treated annually with warfarin, and over 300,000 in the UK,[40,41] this drug is commonly encountered in dental practice. It is used to prevent various thromboembolic events such as those that occur with prosthetic heart valves and atrial fibrillation (Table 3). Warfarin interferes with the synthesis of Vitamin K, which is necessary for thrombin formation and the synthesis of the Vitamin K-dependent coagulant protein factors II (prothrombin), VII, IX, X, and other vitamin K-dependent proteins C and S.[42] Warfarin is bound to albumin, metabolised by the liver, and excreted in the urine. The therapeutic range for warfarin therapy has varied over the last 50 years because there was no standardisation of the prothrombin time (PT) test. When attempts were made to standardise this test in the 1970s, the accepted range of anticoagulation established in the 1940s was found to be too high. This explains the reports in the medical literature of problems with warfarin-related bleeding problems which, along with animal studies, likely initiated the current standards of care for invasive dental procedures.[1,43,44] Therefore, the use of the PT test to evaluate the impact of warfarin was deemed inappropriate. In 1983 the World Health Organization adopted the International Normalised Ratio (INR), which calibrates the thromboplastin used and thereby standardizes PT test values.[45] The INR

Table 3 Therapeutic international normalized ratio (INR) ranges for specific indications[52–54]

Indication	Target INR*
Cardiac arrhythmias (eg atrial fibrillation)	1.5–2.5
Thromboembolic events (DVT, TIA, CVA, PE)† Prosthetic heart valves. Valvular heart disease. Some patients with atrial fibrillation; and following acute MI.	2.0–3.0
Mechanical heart valves (high risk), recurrent systemic embolism, and some MI patients	2.5–4.0

*Approximate ranges

†DVT = deep vein thrombosis, TIA = transient ischemic attacks, CVA = cerebrovascular accident, PE = pulmonary embolism

specifically measures the responsiveness of the thromboplastin to a specific warfarin-induced defect, and it therefore measures the effect of warfarin and not liver function. The baseline INR is 1.0. An INR of 2.0 to 3.0 roughly correlates with a PT ratio of 1.3 to 1.5, and an INR of 3.0 to 4.5 with a PT ratio of 1.5 to 1.9, depending on the sensitivity index of the prothrombin reagent.[45] The therapeutic INR range varies according to the medical indication for its use, but generally falls into three main groups:

1. Cardiac arrhythmias, such as atrial fibrillation
2. Thromboembolic events, prosthetic heart valves, and valvular heart disease, and
3. Mechanical heart valves (Table 3).

Optimal therapeutic ranges for anticoagulation were established in the late 1980s and recommended that the INR value be between 2.0 and 3.0 for most anticoagulation regimens, and in the range of 3.0 to 4.0 for patients with mechanical heart valves and/or a history of recurrent embolism.[46–48] These guidelines significantly lowered the level of anticoagulation for many patients and have thus decreased the incidence of morbidity from clinical bleeding.[43,45] Although the INR system is the appropriate test for patients taking warfarin, its replacement for the PT test in dental practice has been slow.[45,49–52]

DENTAL MANAGEMENT CONSIDERATIONS FOR PATIENTS TAKING WARFARIN

Controversy exists concerning the management of patients taking warfarin who need invasive dental procedures, much of which stems from the legitimate concern and better documented problem of bleeding following non-oral surgical procedures.[53] The guidelines adopted by dentistry are generally without science-based evidence, and stem from case reports in the 1950s suggesting that warfarin posed a significant risk for patients having dental surgery.[1,2] Today, patients on warfarin are felt to be at higher risk for prolonged postoperative bleeding with high INR values (eg >3.5) and when they have an additional coagulopathy.[54] Studies done on patients taking warfarin with INRs in the therapeutic range versus controls found little or no difference in the incidence of clinically significant bleeding, even though some had warfarin levels above the present recommended therapeutic levels, and some underwent extensive oral surgery.[55–59] Nevertheless, it is a common recommendation and standard of care to stop warfarin 2–3 days prior to an invasive dental procedure to decrease the INR value to less than 2.0-2.5.[40,49,60] A survey of practicing physicians in 1996 reports that 73% recommended the withdrawal of warfarin in at least some patients for some dental procedures.[61] A Danish study found that 86% of dentists refer patients to their medical practitioner for adjustments of their warfarin dosage.[62] The dental literature suggests that the preoperative PT/INR test result should be under two times normal for patients taking warfarin,[3] which includes the majority of patients taking this drug. However, there is no scientific evidence that the PT/INR value needs to be this low for invasive dental procedures.

Warfarin has a half life of about 36 hrs, and it may take up to 4 days for the INR to reach 1.5 once warfarin has been stopped depending on the original INR value. However, the INR decreases exponentially and has a wide interpatient variation in the rate of decrease.[63] When restarted, it takes about 3 days to reach an INR of 2.0, such that patients may have at least 2-3 days of subtherapeutic anticoagulation around the time of surgery.[53] This is an especially worrisome practice in patients that have had a thromboembolic event within the past month. Since recurrent embolic events are more frequent, and some will be fatal, elective surgery should be deferred in this time period. In addition to the risk of morbidity and mortality from thromboembolic events, the literature suggests that lowering the INR level is expensive and unnecessary from the standpoint of the likelihood of bleeding from dental procedures.[1,38,50,55,64-69]

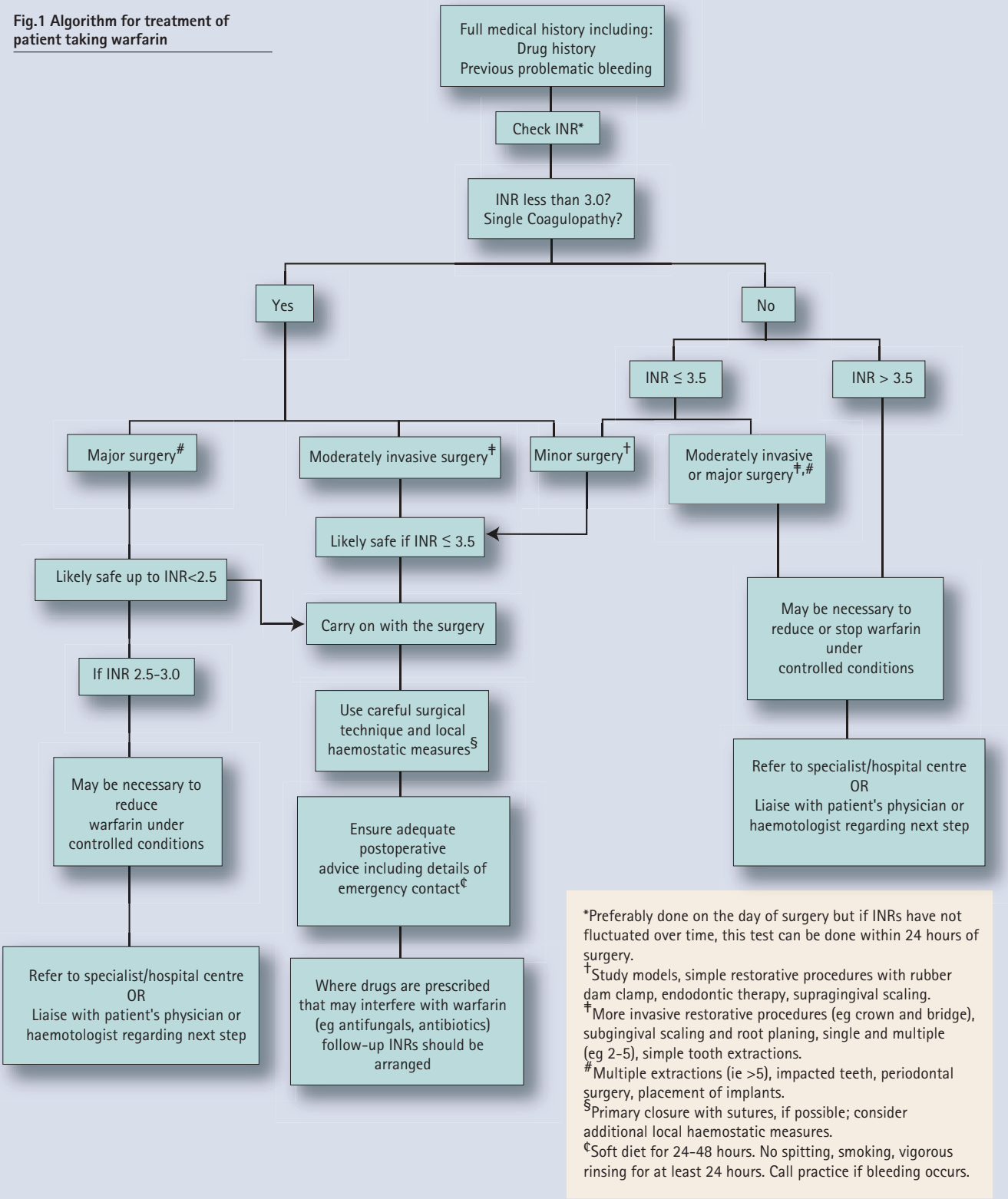
Patients taking more than one anticoagulant, or who have more than one coagulopathy, are at greater risk of intra- and post-operative bleeding from dental procedures. For example, patients taking aspirin are at increased risk for minor prolonged bleeding if also taking warfarin, but there is no difference in major bleeding episodes (Table 1).[70] In addition, paracetamol,[33] broad spectrum antibiotics, chloral hydrate, metronidazole, miconazole and fluconazole can also potentiate the warfarin effect. Similarly, adrenal corticosteroids, barbiturates, and sucralfate can antagonise the effect of warfarin. Finally, conditions such as old age, liver disease, biliary disease, malabsorption, congestive heart failure, fever, hypo- and hyperthyroidism, malnutrition, cancer, and vitamin K excess or deficiency can all interfere with warfarin activity.

The clinical data and anecdotal evidence from dentists who often manage these patients suggests that INR levels within the accepted therapeutic ranges (ie INR ≤3.5) used to treat most medical conditions do not result in clinically significant increased bleeding during or following invasive dental procedures if local measures are used.[64,65,71] The lack of evidence for a risk of bleeding in the dental setting must be contrasted with the case reports of morbidity and mortality in patients who had their continuous anticoagulation withdrawn for any period of time.[59,72–75] A proposed algorithm for treatment of patients on warfarin is shown in Figure 1.

The INR value is accurate only for the time that the blood was taken; and other factors such as dietary considerations (eg vitamin K intake), medications, fever, and liver disease, can all influence the INR test result. Given the fluctuating nature of INR values, the INR test should be repeated within 24 hours of surgery, and ideally the same day. The dental procedure can usually be accomplished with careful attention to local measures, but in rare cases the INR value might need to be lowered. Two days without warfarin will usually bring the INR to an acceptable range, and warfarin can be started again late in the day of surgery. If the need arises to reverse the effect of warfarin, the patient's physician can do so with the administration of vitamin K. For more urgent situations, fresh frozen plasma will provide an almost immediate correction.

Another common protocol calls for the cessation of warfarin altogether until the INR returns to near normal, and then initiating warfarin again after the surgical procedure, which likely puts patients at unnecessary risk. A third protocol, often employed when there is a high risk for complications (eg prosthetic heart valves), is to hospitalise the patient, stop the war-

Fig.1 Algorithm for treatment of patient taking warfarin



farin, and institute intravenous heparin, which is stopped several hours before surgery.[49] Warfarin is then reinstituted 12–18 hours after surgery. Heparin immediately inactivates thrombin and factor Xa, and it is administered to hospitalised patients to prevent clot formation in catheters, shunts, and various pumps and infusion machines (eg dialysis), and therefore it is not relevant to the dental outpatient setting. However, low molecular weight heparin (LMWH) is commonly used for non-hospitalised patients at risk for venous thrombosis. The disadvantages of intravenous heparin use are not shared with LMWH, which inhibits factor Xa and has a lesser effect on inhibition of thrombin, and is therefore more specific in its activity.[76-78] LMWH is given subcutaneously once or twice daily in a dose based on body weight, and since the half life is twice that of standard heparin, no laboratory monitoring is necessary. The activated partial thromboplastin time (aPTT) test is used to monitor anticoagulation from heparin (but not LMWH), and it measures all intrinsic pathway factors except III, VII, and VIII. Although the aPTT

test is usually given as part of the standard coagulation profile from hematology laboratories, its main focus for heparin anticoagulation makes it of little or no value in the evaluation of dental patients in the community setting.

Antibiotics

There have been rare reports suggesting that certain antibiotics (eg metronidazole and erythromycin), and in particular the second and third generation cephalosporins,[47] and antifungal drugs may potentiate bleeding. The mechanism is unclear, but it might be reflected in an alteration of PT/INR test values from an interference with vitamin K metabolism.[79] This can result from fasting, but it is doubtful that this potential interaction would be of clinical significance in an individual with an adequate diet. There are case reports of increased oral bleeding from antibiotics following oral surgery, but in each case patients were on warfarin as well as an antibiotic.[80] Nevertheless, dentists should be aware of this issue and the potential need for appropriate monitoring of the INR for patients taking these drugs.[79]

Herbs and dietary supplements

At least 15 million Americans are taking herbs, high-dose vitamins, or both, combined with prescription drugs.[81] The consumption of alternative supplements by individuals about to undergo surgical procedures have been estimated at over 70%, and 24-35% of patients consumed upwards of 62 different types of herbs, some of which may inhibit coagulation.[82] The most commonly used compounds were echinacea, ginko biloba, St. John's wort, garlic, and ginseng.[83] It has been suggested that upwards of 70% of patients taking herbs do not disclose this in a pre-anesthesia interview.[84] The concern is that many herbs and dietary supplements such as garlic, ginko, and ginseng inhibit platelet adhesion and aggregation, or contain coumarins.[85] Such reports of herb-drug interactions are often without confirmation by laboratory drug analysis, and anticoagulation may be more a laboratory phenomenon than a clinical concern.[86] Nevertheless, patients taking herbs reported to interfere with coagulation should be advised to stop their use within 2 weeks of a surgical procedure until more is known about the potential for complications.

Alcohol

No discussion of drug-induced coagulopathies would be complete without mentioning chronic exposure to alcohol. Liver disease from alcohol abuse is a common cause of a coagulopathy,[87] and the resulting clotting problems could be enhanced by the use of over-the-counter medications, such as NSAIDs. Although alcohol by itself does not cause bleeding, it does potentiate bleeding time prolongation produced by aspirin and non-aspirin NSAIDs.[88] This is of particular significance with the alcoholic patient taking NSAIDs who may also have liver failure, bone marrow involvement, and thrombocytopenia from hypersplenism. Heavy alcohol consumption can also lead to thrombocytopenia through folate deficiency or direct suppression of the bone marrow. Paracetamol is of particular concern in high doses as it is not well metabolised in the presence of hepatitis, and acute liver failure can result.

Cancer chemotherapy

Cancer chemotherapy that significantly suppresses the bone marrow will have the result of interfering with haemostasis primarily through a decrease in the number of platelets. Therefore, the platelet count is the most useful laboratory test in this setting, and it will usually be ordered with a full blood count and differential, as the morbidity associated with invasive dental procedures and low white blood cell counts is of at least equal concern. Ambulatory, non-hospitalised patients receiving chemotherapy should be discussed with their haematologist prior to invasive dental procedures. As a temporary measure, patients with acute dental infection can often be medicated with antibiotics and analgesics if necessary until their white blood cell and platelet counts rise to acceptable levels. If their blood counts are in an acceptable range, these patients can receive dental care without risk of bleeding, however, other considerations may preclude treatment.

GENERAL MANAGEMENT CONSIDERATIONS

Patients taking drugs thought to predispose to a coagulopathy should have a thorough history taken and, if indicated, specific screening tests and physician consultation should be obtained. Modifications to dental management should be based on the current understanding of the risks of altering the patient's medical management versus the risk for oral bleeding. Invasive procedures should be performed as atraumatically as possible, and the patient should be followed more closely than usual following surgery. Various local haemostatic measures have been proposed following surgery, including: primary wound closure, fibrin adhesive, tranexamic acid, thrombin-soaked gauze, and oxycellulose (Part I: Lockhart *et al, Br Dent J* 2003; **195:** 439-445) Unfortunately, there are few if any prospective, controlled, randomised studies of these measures to show a definitive benefit.

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