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Dental management considerations in the elderly with acquired bleeding disorders

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Abstract
Background: Globally, the percentage of elder people is increasing every year and has been projected that by year 2050 one in six people in the world will be 65 years and older. With advancing age, there are increased changes in the hemostatic balance resulting in acquired bleeding disorders. It has become very common for such patients to seek oral healthcare in hospitals and clinics. Hence it is essential that Dentists are able to manage such patients with regards to ensuring patient safety and delivering high standards of care.
Objective: Enable Dental professionals to recognize underlying hematological comorbidities, order and interpret appropriate lab investigations, identify drugs which might cause bleeding during dental treatment, planning and delivering required dental procedures especially invasive procedures such as dental extractions.
Methods: Literature review searches were done PubMed, Wiley Online & Cochrane Library Databases using keywords.

Keywords: Acquired bleeding disorders, elderly population, aging, dental treatment considerations

Introduction
The advancements in medical healthcare systems and practices have led to a global longevity revolution. Along with this increased life expectancy there is also an increase in the comorbidities in older population with bleeding disorders being one of them. These bleeding disorders can be congenital or acquired. Congenital bleeding disorders are genetic in nature and present at birth while acquired bleeding disorders develop after birth or emerge at any point in life [1]. Usually, geriatric patients will be aware of their underlying congenital bleeding disorders and will readily discuss them with their treating dentist. However, acquired bleeding disorders in older people poses serious challenges to the treating dentist. These disorders are not readily diagnosed, their early signs overlooked as consequences of aging or at times the patients themselves might not be aware of their existence as they tend to develop spontaneously [2].
Due to current population trends, older people can be expected to constitute a significant proportion of any dental practice. Hence Dentists need to recognize the balance between the provision of dental care and the oral bleeding such procedures might cause. This article is an attempt at discussing some of the challenges in provision of dental care to such patients and means to overcome them.

Global trends in Aging
Human population aging is a global success phenomenon reflecting advances in medicine, public health, social and economic development which have greatly reduced the risk of premature death [3].

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According to the United Nations Report on World population aging 2019, the number of people worldwide aged 65 and above is projected to grow by 120 % between 2019 and 2050. This growth percentage is expected to be around 197.9 % for people who are 80 years and above in the same time frame.
These projections indicate that the number of people aged 80 and above shall grow at a faster rate than people aged 65 and above in the next three decades worldwide. Therefore, Dentists should be able to treat the elderly bearing in mind the multiple medical conditions, psychological, social and familial factors that might influence provision of care.

Table 1: United Nations Global geriatric population. Growth projections: 2019 to 205Q

Regiem	Number of persons aged 65 years or over in millions		Percentage change between 2019 and 2050 in %	Number of persons aged 80 years or over in millions		Percentage change between 2019 and 2050 in %
	2019	2050		2019	2050	
World	702.9	1548.9	120	143.1	426.4	197_0
Sub-Saharan Africa	31.9	101.4	218	3.7	12.4	238.1
Northern Africa and *Western Asia*	29.4	95.8	226	5.2	20.3	291
Central and Southern Asia	119.0	328.1	176	18.5	62.6	239.0
Eastern and South-Eastern Asia	260.6	572.5	120	48.6	177.0	264.1
Latin America and the Caribbean	56.4	144.6	156	12.0	41.4	245.2
Australia and New Zealand	4.8	8.8	84	1.2	3.3	168.4
Oceania excluding Australia and New Zealand	0.5	1.5	190	0.1	0.2	269.1
Europe and Northern America	200.4	296.2	48	53.9	109.1	102.6

Source: United Nations Department of Economic and Social Affairs, Population Division 2019 world population prospects 2019

Etiology and prevalence of acquired bleeding disorders in the elderly

Bleeding or coagulation disorders like Hemophilia and von Willebrand disease are caused by abnormalities in coagulation factors and may be congenital or acquired. On the other hand, platelet disorders like idiopathic thrombocytopenic purpura and thrombocytopenia are caused by abnormalities in platelet form and function.
Haemostasias changes with aging due to a number of factors. Most coagulation factors and platelet activation increase with age which results in increased thrombin generation [4]. Aging is also associated with decreased fibrinolytic activity, [5] changes in vascular endothelium and impaired renal function. All these factors influence coagulation and hemostatic agent interactions in the elderly. The common acquired bleeding disorders in the elderly are drug induced, secondary to renal impairment/chronic kidney disease, acquired Hemophilia and acquired von Willebrand's disease.

Drug induced

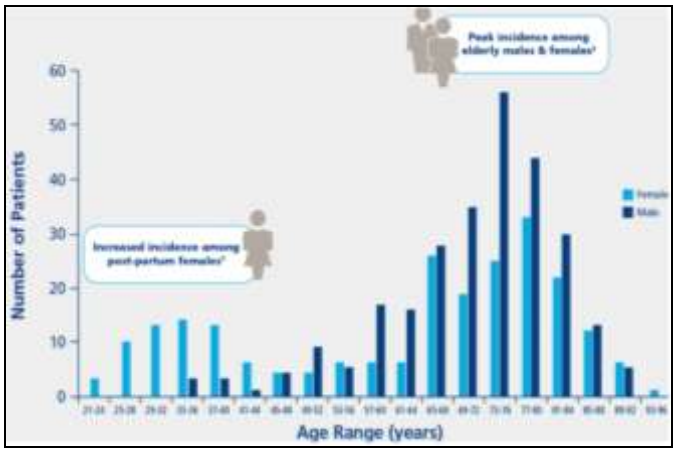
Bleeding in older people is commonly iatrogenic. There is greater use of NSAIDs and aspirin to treat chronic pain associated with aging. Risk of venous thromboembolism and cardiovascular disease in elderly necessitates use of antiplatelet drugs (Aspirin, Clopidogrel) and anticoagulant drugs (Heparin, Warfarin) which increases bleeding risk [6] in older people.

Renal disease

Older people are at greater risk of developing chronic kidney disease (CKD) due to risk factors like diabetes, hypertension and cardiovascular disease [7]. As of 2018, researchers at John Hopkins University USA have estimated that globally 1 in 5 men and 1 in 4 women between ages 65 and 74 years and more than 50 % of people aged 75 or more have chronic kidney disease [8]. There is an increased bleeding tendency in CKD patients, probably due to a functional platelet disorder [9]. The resultant uremic platelets along with associated anemia results in increased perioperative bleeding in CKD patients [10].

Acquired Hemophilia A (AH)

Acquired hemophilia A is characterized by spontaneous bleeding in patients with no prior history of any bleeding disorders [11]. It is caused by the development of IgG auto antibodies to endogenous Factor VIII mostly due to an underlying malignancy or autoimmune disorder. Among older population, 50 % of AH patients are idiopathic with an average age of 73.9 years at diagnosis [12]. Acquired Hemophilia A in older people poses a challenge to the treating dentist as it tends to be undiagnosed probably due to coexistence with other bleeding conditions [13].



Source: Demographic and clinical data in acquired hemophilia A: results from the European Acquired Hemophilia Registry (EACH2). J Thromb Haemost. 2012;10(4):622-631.

Fig 1: Prevalence of Acquired Hemophilia A by age and gender in Europe

Acquired von Willebrand syndrome (AVWS)

Acquired von Willebrand syndrome is a rare disorder caused by increased clearance of von Willebrand factor either by antibodies, increased lysis or decreased synthesis. AVWS has been shown to be exclusively linked to an underlying disorder [14] like cardiovascular or myeloproliferative disorders [15]. Even though this disorder has been seen in children, there are increasing evidence of its presentation with advancing age. The average age at presentation was 64,68 and 62 years for people with lymphoproliferative, cardiovascular disorders or neoplasms as underlying cause [16]. However, it has been seen that AVWS resolves with treatment of the underlying cause.

Dental treatment considerations

History and Evaluation

A negative bleeding history to previous surgical procedures or trauma can eliminate congenital bleeding disorders but might not safely rule out acquired bleeding disorders in the elderly. The American Dental association recommends the following additional questions to be asked to a patient with suspicion of any bleeding disorder.

Table 2 – ADA medical history questionnaire for suspected bleeding disorders

Key questions to ask the patient
• Have you been diagnosed with any bleeding disorder? Can you recollect the diagnosis?
• Do you have any bleeding tendencies?
• Do you get bruises anywhere in your body?
• What were the size of the bruises and do you remember any injury before bruising?
• Have you had any blood transfusions before due to any injury or surgery?
• Have you experienced bleeding with any dental surgical procedures before?
• Did you have to go back to the dentist for suturing/packing after previous dental extractions?
• Were any medical interventions required after previous dental extractions?
• When bleeding occurs, is it superficial (i.e., mucosa, gums) or deep (i.e., hematomas)?
• Are you taking any blood thinning medications such as warfarin, and aspirin?
• If so, what are their doses and how frequently are the doses being monitored by your doctor?

Source: Patton, Lauren L. The ADA practical guide to patients with medical conditions. John Wiley & Sons 2015:183-200.

Affirmative responses to disorders necessitating blood thinning medications or any of the above questions should alert the dentist to initiate further enquiries with the patient's physician prior to designing and implementing any dental treatment plans.

Dentist Physician Coordination

Provision of dental care to older patients with a diagnosed or suspected bleeding disorder requires collaboration between the dentist and patient's physician prior to performing any dental procedure. Apart from the primary physician, the team can include other professionals like a cardiologist, or hematologist depending upon the nature and severity of the underlying disorder. Dental treatment plans might require alterations and/or measures prior to, during and following dental procedures specifically formulated based on medical advice.

The American Dental association recommends the following questions to be asked to a physician providing medical care to a patient with a diagnosed or suspected bleeding disorder.

Table 3 – ADA recommendations on dentist physician communication

Key questions to ask the patients physician
• What is the patient's coagulation disorder and the level of severity?
• What are the laboratory values associated with the patient's bleeding disorder?
• What is the reason for the anticoagulant/antiplatelet therapy?
• How stable is the therapy and the patient's INR if on warfarin or Coumadin®?
• May the patient temporarily discontinue the anticoagulant/antiplatelet therapy prior to dental surgery? The nature and extent of the invasive dental procedure should be explained to the physician. If discontinuing anticoagulant/antiplatelet therapy is recommended, how many days prior to and following the surgical procedure may the patient discontinue the medication?
• If the patient has severe hemophilia, is the patient on weekly factor replacement therapy or home therapy (self-treats)? If so, what schedule replacement levels are achieved?
• Have you directed the patient about required factor replacement levels prior to dental procedures?
• Do you recommend factor replacement therapy prior to specific dental procedures (Block anesthesia, scaling and root planning, dental extractions) or recommend referral &/or admission to the hospital for dental surgery?

Source: Patton, Lauren L. The ADA practical guide to patients with medical conditions. John Wiley & Sons, 2015:183-200 [17]

With key questions answered, communication established between the dentist and the physician, investigations can be performed and dental treatment plans be formulated bearing in mind the severity of the bleeding disorder.

Laboratory investigations

The ability to order and interpret laboratory bleeding tests is essential if a dentist is to provide surgical dental care to older people with any bleeding disorder. The common blood tests advocated to assess bleeding disorders are summarized in the following table.

Table 4: Laboratory investigations used to assess hemostasis

Laboratory Test	Normal Range	What it measures
Complete blood count		
Platelet Count	150,000-400,000 cells/mL	Platelet quality
Ivy bleeding time	Less than 6 min	Platelet function
PFA-100	Closure time <193 s	Quantitative and qualitative measurement of platelet adhesion, activation, and aggregation
PT	11–145 s	Factors II (prothrombin), V, VII, and X, and fibrinogen
INR	1.0	
aPTT	27–38 s	Factors II, V, VIII, IX, X, XI, and XII
Thrombin time (TT)	9–13 s	Abnormalities in the conversion of fibrinogen to fibrin
Anti-factor Xa	0.3–0.7 IU/mL (UH, therapeutic) 0.5–1.2 IU/mL (LMWH, therapeutic)	Plasma UH and LMWH levels

PFA-100: platelet function analyzer 100; UH: unfractionated heparin, PT: Prothrombin time
aPTT: Activated partial thromboplastin time

Source: Journal of Family and Community medicine. 2007;14(2):53-58 [18].

In addition to the basic tests, there are advanced tests used in the diagnosis of AH and AVWS which are summarized in the following table.

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Table 5 – Laboratory evaluation of AH and AVWS

Assay	AH	AVWS
aPTT	Usually prolonged if factor VIII < 30%	Is usually in normal range, but may be prolonged, if factor VIII < 30%
aPTT mixing study	Does not correct after an incubation period and shows a pattern consistent with an inhibitor	Normal
Factor VIII assay	Significantly decreased	Decreased or normal
Bethesda assay	Shows a detectable FVIII inhibitor	Negative unless there is cross reactivity of an antibody in which case the result could be slightly positive
VWF Antigen (Ag)	Normal range	Decreased in most AVWS but can be normal in type 2 and cardiac associated AVWS
VWF Activity (Act-ristocetin cofactor)	Normal range	Decreased in most AVWS but can be normal in cardiac associated AVWS
VWF Ag/Act	Normal range	Decreased to 0.6 in type 2 AVWS and cardiac associated AVWS
VWF multimers	Normal range	Normal in type 1 and 2M subtypes; missing large multimers in type 2A and 2B (large multimers are also absent in cardiac related AVWS, even if Ag and Act are normal)

Source: American Society of Hematology Education Program Book 2015;1(2015):231-236.

Socio-economic considerations and informed consent

Chronologic age cannot be considered as a definitive criterion in geriatric dentistry due to significant heterogenicity in ageing population with respect to physical & mental health, socio-economic status and disparities in oral health. In 1894, Ettinger and suggested the division of ageing population into following three groups based on their ability to seek dental services [19].

1. **Functionally independent older adults** – live unassisted in the community, have sone chronic medical problems and can access dental services by using own or public transportation.

2. **Frail older adults** – includes people who have lost some independence but live-in communities with family or friends. These people can no longer access dental services without the help of others.

3. **Functionally dependent older adults-** includes people cannot live independently in the community and are either home bound or live-in care homes. They require transportation and accompanying people to seek dental services and might require wheelchair assistance or even home visits by the dentist to provide care.

In addition, the provision of dental care also depends on other factors like perceived treatment need – patient, spouse & immediate relatives, people providing activities of daily living support and the financial considerations for the proposed treatment plan.

It is crucial that the dentist is able to communicate with elderly patients and their families. It has been shown that older patients tend to ask fewer questions to their treating physicians even though they seek more clarifications [20]. This is due to sensory and hearing difficulties along with probable cognitive decline which greatly influence informed consent capabilities [21]. Hence the dentist must make every effort to convey the oral health status, proposed treatment plan, costs and any other special requirements to the elderly patients and their families.

Preventive dentistry concepts

Reports worldwide have highlighted the low use of professional dental services by older people [22]. The presence of medical comorbidities and socio-economic drawbacks further complicates the provision of dental care. The following preventive concepts can be recommended by dentists to older patients to try and avoid any possible future ailments.

- Regular periodic professional oral health evaluation
- Topical fluoride mouthwashes and applications - reduce root caries lesions in older people [23].
- Topical fluoride applications with chlorhexidine rinsing reduces tooth loss in elderly [24].
- Chlorhexidine rinses reduce gingival inflammation, pocket depth & denture stomatitis [25].
- Use of electric toothbrushes, adaptive grip modifications of toothbrushes & home care aids
- Professional oral health education improves oral health in older people [26].
- Group based behavior modification intervention improved brushing and flossing skills while reducing gingival bleeding in older people [27].

Local anesthesia and pain management

The use of local anesthetics in older people at the dental office are considered safe when administered properly. There are no significant differences in responses to their administration in the elderly [28]. Use of Local anesthetic agents with vasoconstrictors are also advocated as they provide additional hemostasis. However, it is advised to limit the dose of epinephrine in anesthetics to a maximum of 0.04 mg considering the effects of aging on the heart [29].

It has been shown that hemophilia patients have an 80% chance of developing hematoma following an inferior alveolar nerve block without prior factor VIII cover [30]. This hematoma can be catastrophic as it compromises the airway and accumulates in the mediastinum [31]. Improper needle placement during a posterior superior alveolar nerve blocks also have a tendency to cause hematoma due to trauma of the pterygoid venous plexus [32].

The dentist should discuss prophylactic preoperative factor

VIII cover with the patient's hematologist prior to administering inferior dental & posterior superior nerve blocks, lingual or floor of the mouth infiltration in any bleeding disorder patient [33]. However, mental nerve block buccal infiltration, intrapulpal and intraligamentary anesthetic techniques are safer and do not require factor VIII cover [34].
Paracetamol can be safely used to control dental pain. However, since non-steroidal anti-inflammatory drugs (NSAIDs) effect platelet aggregation, prior consultation with patient's hematologist is necessary before use.

Age related oral mucosal changes and dental considerations

Aging induced oral mucosal changes results in decreased sensitivity to various stimuli, loss of taste and reduced healing potential following mucosal injury. The reactions of oral mucosa to any mechanical trauma like ill-fitting prosthesis change with aging. Such trauma invokes a painful inflammatory response in younger individuals while chronic atrophic processes predominate in the elderly [35]. The following measures can prevent iatrogenic injury to the tissues while carrying out a dental procedure as they have the potential to cause complications in older people with bleeding disorders.

- Careful use of saliva ejectors, covering suction tips with gauze [36].
- Applying soft paraffin (vaseline®) before using rubber dam, matrix bands and wedge [37].
- Using Nonmetallic impression trays, exercising care when removing impressions from mouth
- Consider measures like air abrasion, intra oral scanning & chemo mechanical caries removal [38].
- Use of stable finger rests, good intra oral retractors & intra oral camera
- Ensure proper engagement of needle to syringe body prior to use.
- Avoid excessive pressure during intracanal irrigation

Dental procedure guidelines

Drug induced bleeding disorders

Older patients with drug induced (Aspirin, NSAIDs) functional platelet bleeding disorders do not require alterations on dosage for minor dental procedures [39]. However, for patients on oral anticoagulants (Warfarin) dental treatments can be planned with the patient's hematologist considering the patients International Normalized Ratio (INR) and the nature of the proposed procedure. The following table illustrates the guidelines for performing outpatient dental procedures on warfarin therapy.

Table 6 - Safety of Outpatient Dental Procedures for Patients on Warfarin

Dental Procedure	Suboptimal INR Range		Normal Target INR Range			Out of Range
	<1.5	1.5 to <2.0	2.0 to <2.5	2.5 to 3.0	>3.0 to 3.5	>3.5
				Mechanical Prosthetic Heart Valves		
			Atrial Fibrillation, Venous Thrombosis, Pulmonary or Systemic Embolism, Acute MI			
Examination, radiographs, impressions, orthodontics						
Simple restorative dentistry, supragingival prophylaxis						
Complex restorative dentistry, scaling & root planning, endodontics					Probably safe	
Simple extraction, curettage, gingivoplasty, biopsy				Local measures	Local measures	
Multiple extractions, single bony impaction extraction			Local measures	Local measures	Local measures	
Gingivectomy, minor periodontal flap surgery, apicoectomy, single implant placement	Probably safe	Probably safe	Probably safe			
Full mouth or full arch extractions	Probably safe	Local measures				
Extensive flap surgery, extraction of multiple bony impactions, multiple implant placement	Probably safe					

INR= International Normalized Ratio; MI= Myocardial Infarction. Green indicates that it is safe to proceed in a routine manner (local factors such as periodontitis gingival inflammation can increase severity of bleeding; the clinician should consider all factors when making a risk assessment). Yellow, use caution, but in many instances the procedure can be safely performed with judicious use of local measures. Red, procedures not advised at current INR level; refer to physician for Warfarin adjustment.

Increased need for use of local measures such as sutures, oxidized cellulose, microfibrillar collagen hemostat, topical thrombin and/or epsilon aminocaproic acid or tranexamic acid.

Source: The Journal of American Dental Association 128.3(1997): 327-355 [40].

The hematologist might recommend withholding warfarin for at least 24 hours or longer prior to the dental procedure [41]. For more extensive dental procedures requiring multiple visits, the hematologist might suggest substituting warfarin with low molecular weight heparin [42].

Drug induced, AH and AVWS

For elderly patients with AH and AVWS, the following prophylaxis regimens can be advocated by a hematologist prior to any dental surgical procedure.

- Platelet & fresh frozen plasma transfusions, Vitamin K (iv/sc) administration
- Protamine sulfate (Heparin antagonist) administration [43]
- Desmopressin acetate (iv/sc/intranasal), recombinant factor VIII administration [44] one hour
- prior to dental procedure
- Maintain factor VIII levels - 50-75% before minor oral and periodontal surgery, 75-100 %
- before maxillofacial surgery [45]
- Oral rinse for 2 minutes with 5 % Tranexamic acid mouthwash
- Antibiotic prophylaxis

The following protocols can be implemented by a dentist during and after dental treatment based on the procedure.

Dental extraction & periodontal surgery

- Flapless atraumatic tooth extraction whenever possible
- Use Resorbable hemostatic dressing – oxidized cellulose (Sugicel), Gelatin (Gelfoam)
- Resorbable sutures with simple suture techniques, bite pressure with gauze pack
- Use of preformed vacuum splint to protect socket if necessary
- Provide written & verbal instructions to patients and their caregivers.
- Emergency dental/hospital contact numbers to be provided – for post-operative emergencies
- Advice 5 % Tranexamic acid mouthwash 4 times /1-gram tablets 3 times - daily for 7-10 days

Other Dental procedures like supragingival scaling, full & partial prosthodontics & endodontic treatments are generally considered safe for elderly patients with bleeding disorders. It is advisable to design restorations and fixed prosthesis with supra gingival margins and trim sharp edges in clasp wires and other restorations that might injure oral tissues and cause bleeding.

Conclusion

Oral health is an integral part of general health and wellbeing of elderly. Dentists must understand the influence of social and medical factors on oral health which in turn influences the design and provision of dental treatment. The occurrence of AH and AVWS in older people are rare and are often not diagnosed which can lead to fatal consequences. Hence dentists must employ a team approach to care provision which involves summative risk assessments and designing a treatment plan which ensures optimal oral health which fits into the comprehensive needs of older people.

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