Test Definition: VWFMS

von Willebrand Factor Multimer Analysis, Plasma

Overview

Useful For

Resolving discrepancies when results of complementary laboratory tests (eg, F8A / Coagulation Factor VIII Activity Assay, Plasma; VWACT / von Willebrand Factor Activity, Plasma; and VWAG / von Willebrand Factor Antigen, Plasma) are abnormally low or discordant

Subtyping von Willebrand disease (VWD) (primarily identify variants of type 2 VWD)

Aiding in determining appropriate treatment

Identifying variants of type 2 VWD that have fewer of the largest multimers, have unusually large multimers, or have qualitatively abnormal "bands" that indicate an abnormal von Willebrand factor structure

Special Instructions

- Coagulation Guidelines for Specimen Handling and Processing
- Coagulation Patient Information

Method Name

Agarose Gel Electrophoresis/Infrared Dye-Labeled Antibody Detection

NY State Available

Yes

Specimen

Specimen Type

Plasma Na Cit

Ordering Guidance

Coagulation testing is highly complex, often requiring the performance of multiple assays and correlation with clinical information. For that reason, AVWPR / von Willebrand Disease Profile, Plasma is recommended.

Additional Testing Requirements

VWACT / von Willebrand Factor Activity, Plasma and VWAG / von Willebrand Factor Antigen, Plasma are requested but not required before performing this test. If already assayed, submit results. If no results are included, submit separate specimens for the above assays following specimen requirements for each test.

Specimen Required

Specimen Type: Platelet-poor plasma

Patient Preparation:
1. Fasting: 8 hours, preferred but not required
2. Specimen should be collected prior to coagulation factor replacement therapy.
Collection Container/Tube: Light-blue top (3.2% sodium citrate)
Submission Container/Tube: 13-mm x 75-mm, 5-mL, plastic vial (polypropylene preferred)
Specimen Volume: 1 mL Platelet-poor plasma
Collection Instructions:
1. For complete instructions, see Coagulation Guidelines for Specimen Handling and Processing.
2. Centrifuge, transfer all plasma into a plastic vial, and centrifuge plasma again.
3. Aliquot plasma into a plastic vial leaving 0.25 mL in the bottom of centrifuged vial.
4. Immediately freeze plasma (no longer than 4 hours after collection) at -20 degrees C or, ideally, -40 degrees C or below.
Additional Information:
1. A double-centrifuged specimen is critical for accurate results as platelet contamination may cause spurious results.
2. Each coagulation assay requested should have its own vial.

Forms
1. Coagulation Patient Information (T675)
2. If not ordering electronically, complete, print, and send a Coagulation Test Request (T753) with the specimen.

Specimen Minimum Volume
Platelet-poor plasma: 0.5 mL

Reject Due To

Gross hemolysis	Reject
Gross lipemia	Reject
Gross icterus	Reject

Specimen Stability Information

Specimen Type	Temperature	Time	Special Container
Plasma Na Cit	Frozen	42 days	

Clinical & Interpretive

Clinical Information
von Willebrand factor (VWF) is a large multimeric plasma glycoprotein that has essential roles in primary hemostasis. Wild-type VWF molecules are series of multimers varying in size from dimers to multimers over 40 subunits (>10 million Da). The largest multimers provide multiple binding sites that can interact with both platelet receptors and subendothelial matrix sites of injury and are the most hemostatically active form of VWF. The biological functions of VWF are as follows:

1. VWF is a ligand and mediates platelet adhesion to the subendothelial collagen at the site of vessel wall injury by binding to the platelet receptor glycoprotein (GP)-Ib, V, IX complex, and subendothelial collagen
2. VWF binds and stabilizes procoagulant factor VIII in the circulation
3. Under conditions of high shear, VWF also mediates platelet-platelet cohesion by binding to the platelet receptor GP-IIb/IIIa (integrin alpha IIb beta3)

von Willebrand disease (VWD) is the most common hereditary bleeding disorder that is caused by quantitative or qualitative VWF defect. VWD manifests clinically as easy bruising, mucocutaneous bleeding (eg, epistaxis, menorrhagia), and bleeding after trauma or surgery.

von Willebrand disease has been classified into 3 major types:
-Type 1, typically an autosomal dominant disease, is the most common, accounting for approximately 70% of VWD patients. It represents a quantitative deficiency of VWF of variable severity.
-Type 2, which is usually an autosomal dominant disease, is characterized by several qualitative abnormalities of VWF. Four subtypes have been identified: 2A, 2B, 2M, and 2N.
-Type 3, an autosomal recessive disorder, leads to severe disease with virtually undetectable levels of VWF, as well as very low levels of factor VIII.

Acquired von Willebrand syndrome (AVWS) is associated with a number of different disease states and is caused by several different pathophysiological mechanisms, including antibody formation, proteolysis, binding to tumor cells with increased clearance, and decreased synthesis. AVWS is most frequently described in patients with dysproteinemias (including monoclonal gammopathy of undetermined significance, multiple myeloma, and macroglobulinemia), lymphoproliferative disorders, myeloproliferative disorders (eg, essential thrombocythemia), autoimmune diseases (eg, systemic lupus erythematosus), high-shear stress cardiovascular conditions (eg, severe aortic stenosis), gastrointestinal angiodysplasia, and hypothyroidism.

Reference Values
An interpretive report will be provided.

Interpretation
The plasma von Willebrand factor (VWF) multimer analysis is a qualitative visual assessment of the size spectrum and the banding pattern of VWF multimers.

Cautions
Von Willebrand factor (VWF) multimer analysis is not useful if the following tests are normal:
-F8A / Coagulation Factor VIII Activity Assay, Plasma
-RIST / Ristocetin Cofactor, Plasma
-VWACT / von Willebrand Factor Activity, Plasma
-VWAG / von Willebrand Factor Antigen, Plasma

Or when:
-The VWF ristocetin cofactor:VWF antigen ratio is greater than or equal to 0.7
-The VWF activity:VWF antigen ratio is greater than or equal to 0.8

Clinical Reference

1. Budde U, Schneppenheim R. von Willebrand Factor and von Willebrand Disease. Rev Clin Exp Hematol. 2001 Dec;5.(4):335-368
2. Ruggeri ZM. Structure and function of von Willebrand factor: Relationship to von Willebrand's disease. Mayo Clinic Proc. 1991;66(8):847-861
3. Sadler JE. A revised classification of von Willebrand disease. Thromb Haemost. 1994;71:520-525
4. Laffan M, Brown SA, Collins PW, et al. The diagnosis of von Willebrand disease: a guideline from the UK Haemophilia Centre Doctors Organization. Haemophilia. 2004;10(3):199-217
5. Mannucci PM. Treatment of von Willebrand's disease. N Engl J Med. 2004;351(7):683-694
6. Pruthi RKl, Daniels TM, Heit JA, et al. Plasma von Willebrand factor multimer quantitative analysis by in-gel immunostaining and infrared fluorescent imaging. Thromb Res. 2010;126(6):543-549
7. Ng C, Motto DG, Di Paola J. Diagnostic approach to von Willebrand disease. Blood. 2015;125(13):2029-2037
8. Favaloro EJ, Lippi G. eds. Hemostasis and Thrombosis, Methods and Protocols. Humana Press; 2017

Performance

Method Description

Platelet-poor plasma proteins are denatured using heat and an anionic detergent, sodium dodecyl sulfate. The sample is then electrophoresed through a discontinuous agarose gel on a cooled horizontal electrophoresis unit overnight to separate the von Willebrand factor (VWF) multimers by size. The gel is fixed in acid and isopropanol, washed in water, and incubated with dilute rabbit-antihuman VWF. After washing away unbound antibody, the gel is incubated with dilute goat-antirabbit IgG antibody tagged with an infrared dye. Excess secondary antibody is washed away, and the gel is scanned using an infrared imaging system. The digitized image of the electrophoretic distribution of the VWF multimers is interpreted by a coagulation consultant and a written report is provided.(Favaloro EJ, Koutts J. Diagnosis of von Willebrand disease. In: Kottke-Marchant K, ed. Laboratory Hematology Practice. Wiley Blackwell; 2012:447-459; Favaloro EJ, Lippi G. eds. Hemostasis and Thrombosis, Methods and Protocols. Humana Press; 2017)

PDF Report

No

Day(s) Performed

Monday through Thursday

Report Available

7 to 14 days

Specimen Retention Time

21 days

Performing Laboratory Location

Mayo Clinic Laboratories - Rochester Main Campus

Test Definition: VWFMS

von Willebrand Factor Multimer Analysis, Plasma

Fees & Codes

Fees

- Authorized users can sign in to Test Prices for detailed fee information.
- Clients without access to Test Prices can contact Customer Service 24 hours a day, seven days a week.
- Prospective clients should contact their account representative. For assistance, contact Customer Service.

Test Classification

This test was developed and its performance characteristics determined by Mayo Clinic in a manner consistent with CLIA requirements. It has not been cleared or approved by the US Food and Drug Administration.

CPT Code Information

85247

LOINC® Information

Test ID	Test Order Name	Order LOINC® Value
VWFMS	von Willebrand Factor Multimer, P	48595-3

Result ID	Test Result Name	Result LOINC® Value
603851	von Willebrand Factor Multimer, P	No LOINC Needed
603855	VWF Multimer Interpretation	48595-3