Objectives: To investigate the mechanisms associated with pathological vascular aging. Aging has consistently been described as an independent risk factor for the development of atherosclerotic lesions. However, the underlying biomolecular mechanisms are not well understood. Recently, we have identified the key role of platelet-derived migration inhibitory factor-related protein 14 (Mrp-14) in promoting stenosis in peripheral arteries. Here, we tested the hypothesis that Mrp-14 might contribute to age-related vascular disease by coordinating inflammation and senescence of arterial macrophages. Methods: Abundance of Mrp-14 mRNA, age-associated senescence and inflammatory markers were assessed in the aortic tissue of young (12-16 weeks old; n=4) and old (>70 weeks old; n=4) C57Bl/6 wild-type mice, by quantitative-PCR (qPCR). The accumulation of monocyte-platelet aggregates (MPAs), previously shown to be mediated by platelet-derived Mrp-14, was profiled in the peripheral blood by flow cytometry. The directed chemotaxis of young and old bone marrow-derived macrophages (BMDMs) was monitored in the presence or not of anti-Mrp-14 blocking antibody by automated xCELLigence migration system. Senescence-associated secretory phenotype (SASP) was characterized in young and old BMDMs by qPCR analysis. Results: Mrp-14 and macrophage marker Cd68 mRNA levels were robustly increased in old vs young aortas (7.13 ± 0.79 vs 1.0 ± 0.04; P <.01 and 7.33 ± 3.40 vs 1.0 ± 0.15; P <.05 respectively). Prototypical senescence (Cdkn2a, Cdkn1a, Tp53, Glb1) and pro-inflammatory markers (Nos2, Ccl2, NADPH oxidase subunits) were overexpressed within the old aortas compared to chronologically young tissues. MPAs, potentially enriched with Mrp-14, were significantly higher in the blood of old vs young mice (27.83 ± 2.46% vs 11.03 ± 5.94%; P =.006). SASP-associated gene transcripts (Il1a, Il1b, Il6, Cxcl1) were significantly upregulated in old activated BMDMs compared to younger cells. Consistently, the protein expression of beta-galactosidase, a key marker of senescence, was increased in old BMDMs, validating their state of senility. Notably, old activated BMDMs demonstrated increased directed migration compared to young cells (F (1,24) = 138.9; P <.001). SASP and locomotion of old BMDMs were reversed in the presence of antibody-mediated Mrp-14 blockade. Conclusions: Mrp-14 is a pathological signal that fine-tunes senescence and inflammation in the aged aorta. Strategies to manipulate Mrp-14 might be important tools to curb premature vascular aging and prevent the progression of atherosclerotic lesions in the vasculature.