Print ISSN: 2321-6379
Online ISSN: 2321-595X
DOI: 10.17354/ijss/2017/369

Original Article

Comparative Study on Safety and Efficacy of Low-Molecular-Weight Heparins with Unfractionated Heparins in the Management of Coronary Artery Disease in A Rural Tertiary Care Hospital

S Selvamuthukumaran

Reader, Division of General Medicine, Department of General Medicine, Rajah Muthiah Medical College and Hospital, Annamalai University, Chidambaram, Tamil Nadu, India

Abstract

Introduction: Low-molecular-weight heparin (LMWH) fractions are prepared from standard unfractionated heparin (UFH) and are thus similar to UFH in many aspects.

Aim: This study compares the safety and efficacy of LMWH with UFH in the management of acute coronary artery disease.

Materials and Methods: A total of 133 patients admitted in critical care unit with a history of chest pain and associated electrocardiogram finding were included administered LMWH and UFH for 5 days and studied.

Results: Compared to UFH group of patients, the average prothrombin time was higher. 4% of patients had thrombocytopenia in UFH and no events seen in LMWH.

Conclusion: Antithrombotic therapy with LMWH was safer and more effective than UFH in reducing the incidence of ischemic events in patients with unstable angina or myocardial infarction in the early phase.

Key words: Anticoagulant, Coronary heart disease, Safety and efficacy, Unfractionated heparin

INTRODUCTION

Both unfractionated heparin (UFH) and low-molecular-weight heparins (LMWHs) have established roles in preventing and treating venous thromboembolism and as adjuvant therapies for atherothrombotic syndromes.[1,2] UFH acts as an anticoagulant by forming a complex with antithrombin (AT) catalyzing the inhibition of several activated blood coagulation factors: Thrombin (factor IIa), factor IXa, Xa, XIa, and XIIa. This prevents fibrin formation and inhibits thrombin-induced activation of platelets and factors V, VIII, and XI.[3-6] Smaller heparin chains (<18 saccharide U) are too short to bind to AT and thrombin simultaneously but can inactivate factor Xa by binding to AT alone. LMWHs are derived from UFH by chemical or enzymatic depolymerization and have reduced inhibitory activity against thrombin (factor IIa) relative to factor Xa. LMWHs have more predictable pharmacokinetic properties compared with UFH which allows LMWHs to be administered in fixed doses and without the need for dose adjustment based on laboratory monitoring.[7,8] The use of a heparin dosing nomogram is encouraged because it helps achieve and maintain the activated partial thromboplastin time (aPTT) in the therapeutic range efficiently. The aPTT is used to monitor the effects of heparin treatment.

Access this article online

www.ijss-sn.com

Month of Submission : 05-2017
Month of Peer Review : 06-2017
Month of Acceptance : 07-2017
Month of Publishing : 07-2017

Aim

To study the safety and efficacy of LMWH with UFH in the management of coronary artery disease (CAD).

Corresponding Author: S. Selvamuthukumaran, Division of General Medicine, Rajah Muthiah Medical College and Hospital, Annamalai University, Chidambaram, Tamil Nadu, India. Phone: +91-9843466684. E-mail: dr_smk2010@rediffmail.com

MATERIALS AND METHODS

This prospective comparative study was conducted in the Department of Medicine at Rajah Muthiah Medical College and Hospital, Annamalai University. 113 patients were selected based on "direct patient recruitment" method. Inclusion criteria: Patients, men, and women above age 18 years of age who were admitted in coronary care unit with a history of chest pain and associated electrocardiogram finding and received either LMWH or UFH for 5 days. Exclusion Criteria: Patients who received more both LMWH and UFH, patients who received anticoagulants other than LMWH and UFH, patients with increased risk of bleeding, ulcer disease or gastrointestinal bleeding during past 5 years, patients who underwent surgery during previous week, surgery of the eye, ear or cerebro neuronal system during previous month, patients with known defects of hemostasis, platelet count <50% of normal, hypersensitivity to study drugs, pregnant and nursing women, patients who received heparin <5 days were excluded from the study.

RESULTS

Overall 113 patients included in the study, 60% were male and 40% were female (Figure 1). 56% of study population were <60 years (Figure 2). Two groups were similar with respect to demographics such as age, sex, and weight. The baseline electrocardiographic changes and risk factors associated with the disease did not differ among the two study groups. 55% of patients received LMWH and 45% of patients received UFH. Myocardial infraction is high in study patients 37% followed by ischemia 35% (Table 1). ST-segment elevation myocardial infarction (STEMI) was observed in 59% of patients, non–STEMI in 22 patients. LMWH has average prothrombin time 30 s and UFH has 27 s (Table 2). 4% of patients had thrombocytopenia in UFH and no events seen in LMWH (Table 3). 100% of patients in LMWH shown decreased severity of signs and symptoms whereas UFH is shown in 84% patients (Table 4).

DISCUSSION

CAD refers to a spectrum of clinical presentations ranging from those for STEMI to presentations found in NSTEMI or in unstable angina. In terms of pathology, CAD is almost always associated with rupture of an atherosclerotic plaque and partial or complete thrombosis of the infarct-related artery. Initial therapy for CAD should focus on stabilizing the patient's condition, relieving ischemic pain, and providing antithrombotic therapy to reduce myocardial damage and prevent further ischemia. Previous randomized clinical trials have shown that LMWH is at least as good as, if not better than, UFH in preventing pre-operative deep venous thrombosis and thromboembolism after major abdominal surgery and total hip or knee arthroplasty. The benefit of LMWHs is not canceled by an increase in hemorrhagic complications. At least two studies have also documented the superior efficacy and safety of LMWH administered at home as compared to in hospital intravenous UFH, in treating patients with established deep vein thrombosis. Recently, clinical trials have also been published indicating that LMWH may be beneficial in treating arterial diseases.[9-13] Over many years of clinical use, heparin has been a remarkably safe drug, especially considering its biological origin and its heterogeneity. The main concern, as with all anticoagulants, is excessive bleeding, and the issue of whether LMWH is associated with less bleeding than UFH has been dealt with in earlier sections. The methods of manufacture of LMWHs should

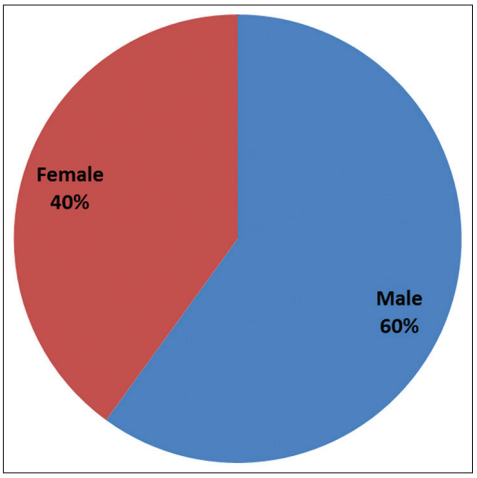

Figure 1: Distribution of gender

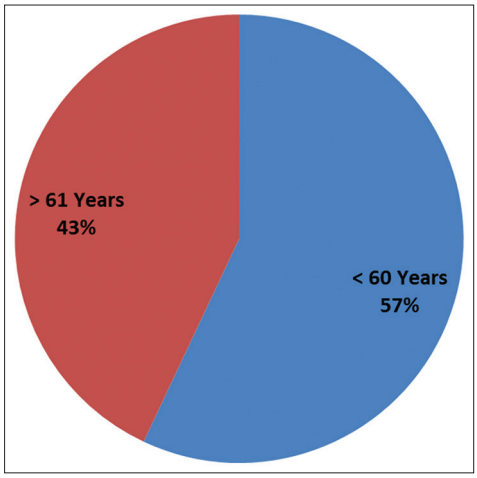

Figure 2: Age distribution of study population

Table 1: Diagnosis distribution in study population

Diagnosis	Number of patients	Percentage of patients
Unstable angina	20	18
Stable angina	12	11
Myocardial infarction	42	37
Ischemic	39	35

Table 2: Average prothrombin time

Age distribution of study population	Average prothrombin time in seconds
LMWH	27
UFH	30

Table 3: Effect of LMWH and UFH on platelets in the study population

Drug	Number of patients	Thrombocytopenia	%
LMWH	62	0	0
UFH	51	5	4

LMWH: Low-molecular-weight heparin, UFH: Unfractionated heparin

Table 4: Effect of LMWH and UFH on severity of signs and symptoms in patients

DRUG	Number of patients admitted	Number of patients with decrease in severity	Percent of patients
LMWH	62	62	100
UFH	51	43	84

LMWH: Low-molecular-weight heparin, UFH: Unfractionated heparin

not give additional safety concerns, and any possible differences in side effects between LMWH and UFH are likely to rest on molecular-weight differences, with LMWH having lesser interaction with heparin binding proteins and cells.

REFERENCES

1. Garcia DA, Baglin TP, Weitz JI, Samama MM. Parenteral anticoagulants: Antithrombotic therapy and prevention of thrombosis, 9th ed: American college of chest physicians evidence-based clinical practice guidelines. Chest 2012;141:e24S-43.
2. Monagle P, Chan AK, Goldenberg NA, Ichord RN, Journeycake JM, Nowak-Göttl U, *et al.* Antithrombotic therapy in neonates and children: Antithrombotic therapy and prevention of thrombosis, 9th ed: American College of chest physicians evidence-based clinical practice guidelines. Chest 2012;141:e737S-801.
3. Geerts WH, Bergqvist D, Pineo GF, Heit JA, Samama CM, Lassen MR, *et al*. Prevention of venous thromboembolism: American college of chest physicians evidence-based clinical practice guidelines (8th Edition). Chest 2008;133 6 Suppl:381S-453.
4. Anderson JL, Adams CD, Antman EM, Bridges CR, Califf RM, Casey DE Jr, *et al*. ACC/AHA 2007 guidelines for the management of patients with unstable angina/non-ST-Elevation myocardial infarction: A report of the American college of cardiology/American heart association task force on practice guidelines (Writing committee to revise the 2002 guidelines for the management of patients with unstable Angina/Non-ST-elevation myocardial infarction) developed in collaboration with the American college of emergency physicians, the society for cardiovascular angiography and interventions, and the society of thoracic surgeons endorsed by the American association of cardiovascular and pulmonary rehabilitation and the society for academic emergency medicine. J Am Coll Cardiol 2007;50:e1-157.
5. Dolovich LR, Ginsberg JS, Douketis JD, Holbrook AM, Cheah G. A meta-analysis comparing low-molecular-weight heparins with unfractionated heparin in the treatment of venous thromboembolism: Examining some unanswered questions regarding location of treatment, product type, and dosing frequency. Arch Intern Med 2000;160:181-8.
6. Hirsh J, Bauer KA, Donati MB, Gould M, Samama MM, Weitz JI. Parenteral anticoagulants: American college of chest physicians evidence-based clinical practice guidelines (8th Edition). Chest 2008;133 6 Suppl:141S-59.
7. Merli GJ, Vanscoy GJ, Rihn TL, Groce JB 3rd, McCormick W. Applying scientific criteria to therapeutic interchange: A balanced analysis of low-molecular-weight heparins. J Thromb Thrombolysis 2001;11:247-59.
8. Fareed J, Fu K, Yang LH, Hoppensteadt DA. Pharmacokinetics of low molecular weight heparins in animal models. Semin Thromb Hemost 1999;25:51-5.
9. Misra UK, Kalita J, Chandra S, Kumar B, Bansal V. Low molecular weight heparin versus unfractionated heparin in cerebral venous sinus thrombosis: A randomized controlled trial. Eur J Neurol 2012;19:1030-6.
10. Fihn SD, Gardin JM, Abrams J, Berra K, Blankenship JC, Dallas AP, *et al.* 2012 ACCF/AHA/ACP/AATS/PCNA/SCAI/STS guideline for the diagnosis and management of patients with stable ischemic heart disease: Executive summary: A report of the American college of cardiology foundation/American heart association task force on practice guidelines, and the American college of physicians, American association for thoracic surgery, preventive cardiovascular nurses association, society for cardiovascular angiography and interventions, and society of thoracic surgeons. Circulation 2012;126:3097-137.
11. Amane HS, Burte NP. A comparative study of dalteparin and unfractionated heparin in patients with unstable angina pectoris. Indian J Pharmacol 2011;43:703-6.
12. Comp PC, Spiro TE, Friedman RJ, Whitsett TL, Johnson GJ, Gardiner GA Jr, *et al.* Prolonged enoxaparin therapy to prevent venous thromboembolism after primary hip or knee replacement. Enoxaparin clinical trial group. J Bone Joint Surg Am 2001;83-A:336-45.
13. Levine M, Gent M, Hirsh J, Leclerc J, Anderson D, Weitz J, *et al.* A comparison of low-molecular-weight heparin administered primarily at home with unfractionated heparin administered in the hospital for proximal deep-vein thrombosis. N Engl J Med 1996;334:677-81.

How to cite this article: Selvamuthukumaran S. Comparative Study on Safety and Efficacy of Low-Molecular-Weight Heparins with Unfractionated Heparins in the Management of Coronary Artery Disease in A Rural Tertiary Care Hospital. Int J Sci Stud 2017;5(4):225-227.

Source of Support: Nil, **Conflict of Interest:** None declared.