

A study of cardio- protective properties of omega-3 fatty acids after occurrence of acute myocardial ischemia in patients admitted to Al- Hussein Hospital in Karbala

دراسة في بعض الخصائص الوقائية للأحماض الشحمية الاوميكا- ٣ على القلب بعد حدوث فقر الدم الاحتباسي الحاد في القلب لدى مرضى راقدين في مستشفى الحسين في كربلاء

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Abstract:

Acute myocardial ischemia is one of the most common general health problem facing human being nowadays. In this study, we aimed to determine if the omega-3 fatty acid have a significant cardio-protective effect against myocardial ischemia or not in many patient who were admitted to Al-Hussein Hospital in Karbala. It was found that omega-3 has the ability to reduce cardiac troponin, cardiac creatin kinase, triglyceride and VLDL very significantly at $p < 0.05$. A sixty males with average age between 55-65 years old were divided into 2 groups equally. The first group was given n-3 fatty acid 1000 mg twice daily and the 2nd group was control group. There were significant reduction of all the parameters of the study (troponin reduced from 100% to 15%, creatine kinase reduced from 66 U\L to 41 U\L, VLDL reduced from 60 mg\dL to 5 mg\dL and triglyceride reduced from 96 mg\dL to 50 mg\dL) during the 30 days of the study. These results suggested that this agent had a significant cardio-protective properties against acute cardiac attack.

الخلاصة:

تعد إصابات القلب الحادة الناتجة عن فقر الدم الاحتباسي واحدا من أكثر المشاكل الصحية شيوعا و التي تواجه الإنسان. ولقد استهدفت هذه الدراسة معرفة فيما إذا كان للأحماض الشحمية الاوميكا ٣ تأثيرا وقائيا ضد إصابات القلب الحادة الناتجة عن فقر الدم الاحتباسي لعدد من المرضى الموجودين في مستشفى الحسين العام في محافظة كربلاء ولقد وجد أن باستطاعة هذه المادة تقليل معدل كل من التروبونين و إنزيم الكرياتين كينيز و الدهون الثلاثية والكوليستيرول المنخفض الكثافة بصورة ملحوظة جدا لذلك يمكن أن تكون هذه المادة علاجا مستقبليا لإصابات القلب. لقد قسم ستون شخصا من الذكور يتراوح أعمارهم بين الخمس و الخمسون و الخمس والستون من العمر إلى مجموعتين متساويتين وتم إعطاء المجموعة الأولى مادة الاوميكا-٣ بجرعة ١٠٠٠ ملغم مرتان في اليوم بينما كانت المجموعة الثانية مجموعة سيطرة. ولقد ظهر حصول نقصان ملفت للغاية لجميع معايير الدراسة (التروبونين تناقص من ١٠٠٪ إلى ١٥٪ ، الكرياتين كينيز تناقص من ٦٠٪ إلى ١٥٪ ، الكوليستيرول المنخفض الكثافة تناقص من ٩٦ ملغم\ديسيليتير إلى ٥ ملغم\ديسيليتير وأخيرا تناقصت نسبة الدهون الثلاثية من ٩٦ ملغم\ديسيليتير إلى ٥٠ ملغم\ديسيليتير) خلال ٣٠ يوما من أيام الدراسة. إن هذه النتائج تبين إن مادة الاوميكا-٣ ذات خاصية وقائية ضد الإصابات القلبية الحادة الناتجة عن فقر الدم الاحتباسي .

Introduction:

Acute myocardial ischemia is commonly known as a heart attack, occurs when the blood supply to part of the heart is interrupted causing some heart cells to die. This is most commonly due to occlusion (blockage) of a coronary artery following the rupture of a vulnerable atherosclerotic plaque, which is an unstable collection of lipids (like cholesterol) and white blood cells (especially macrophages) in the wall of an artery. The resulting ischemia (restriction in blood supply) and oxygen shortage, if left untreated for a sufficient period of time, can cause damage and/or death (infarction) of heart muscle tissue (myocardium). Omega-3 fatty acids (popularly referred to as n-3 fatty acids or n-3 fatty acids) are a family of unsaturated fatty acids that the human body cannot synthesizen-3 fatty acids de novo so it must be obtained from food. In 1992 article⁽¹⁾ provides an overview of the research into Omega-3 fatty acids fatty acids, and is the basis of this section. The 'essential' fatty acids are essential to normal growth in young children and animals and supporting dermal integrity, renal function, and parturition. On September 8, 2004, the U.S. Food and Drug Administration gave "qualified health claim" status to eicosapentaenoic acid (EPA) and

docosahexaenoic acid (DHA) n-3 fatty acids, stating that "supportive but not conclusive research shows that consumption of EPA and DHA [n-3] fatty acids may reduce the risk of coronary heart disease.⁽²⁾ There is a promising preliminary evidence that omega-3 fatty acids supplementation might be helpful in cases of depression and anxiety⁽³⁾. Studies report highly significant improvement from omega-3 fatty acids supplementations alone and in conjunction with medication⁽⁴⁾. Some researches suggest that fish oil intake may reduce the risk of ischemic and thrombotic stroke. However, very large amounts may actually increase the risk of hemorrhagic stroke⁽⁵⁾. In 1999, the Gruppo Italiano per lo Studio della Sopravvivenza nell'Infarto Miocardico (GISSI)-Prevenzione Investigators reported in the Lancet, the results of major clinical study in 11,324 patients with a recent myocardial infarction. Treatment ONE gram per day of n-3 fatty acids reduced the occurrence of death, cardiovascular death and sudden cardiac death by 20%, 30% and 45% respectively⁽⁶⁾. In April 2006, a team led by Lee Hooper at the University of East Anglia in Norwich, UK, published a review of almost 100 separate studies into n-3 fatty acids, found in abundance in oily fish. It concluded that they have a significant protective effect against cardiovascular disease⁽⁷⁾. In other two different reviews performed in 2006 by the American Journal of Clinical Nutrition⁽⁸⁾ that both indicated decreases in total mortality and cardiovascular incidents (i.e. myocardial infarctions) associated with the regular consumption of fish and fish oil supplements. In another study published in the American Journal of Health System Pharmacy March 2007, patients with high triglycerides and poor coronary artery health were given 4 grams a day of a combination of EPA and DHA along with some monounsaturated fatty acids. Those patients with very unhealthy triglyceride levels (above 500 mg/dl) reduced their triglycerides on average 45% and their VLDL cholesterol by more than 50%. VLDL is a bad type of cholesterol and elevated triglycerides can also be deleterious for cardiovascular health⁽⁹⁾.

Dietary sources:

Include fish, flax which has a very high n-3 content Six times richer than most fish oils in n-3⁽¹⁰⁾, milk and cheese, eggs⁽¹¹⁾, and meat⁽¹²⁾.

Mateials and Method:

A sixty male, with age ranged between 55-65 years old with a history of chronic hypertension were followed for 30 days after occurrence of first attack of myocardial ischemia (myocardial infarction or unstable angina) in Al- Hussain General Hospital in Karbala. The patients were divided into 2 groups, Group I: In which 30 patients were taken omega-3 fatty acid 9Salamon fish oil) just after the onset of acute cardiac ischemia at a dose of 1000 mg twice daily by oral route. Group II: (Control group), the other 30 patients not received omega-3 fatty acid All these patients were followed by assessing cardiac specific troponin, triglyceride level, creatin kinase, and very low density lipoprotein (VLDL- Cholesterol).

Statistical analysis:

In this study, Chi square test⁽¹³⁾ and *t*-test⁽¹⁴⁾ were used as analytical method for the results.

Materials:

1- Cardiac specific troponin (c-Tn): This test is very specific and sensitive for myocardial ischemia⁽¹⁵⁾. At room temperature, 2 drops of the specimen (=50 micro liter) was added to the specimen well(s). Positive results appeared as two colored lines in the kit of the test device.

2- Determination of Creatin kinase (CK): The serum level exceeds normal range within 4-8 hours after the onset of acute myocardial attack and declines at 2-3 days⁽¹⁶⁾.

3 Determination of serum Triglyceride concentration:

Procedure:

	Sample	Standard	Blank
Working reagent	1ml	1ml	1ml
Sample	10 µl	-	-
Standard	-	10 µl	-
Distal water	-	-	10 µl
Mixture was left for 5 mints at 37 C°, then the absorbance was read at 550 nm			

Calculations: Triglycerides in the sample mg /dl = (absorbance sample/ absorbance of standard) × concentration of standard.

4- Determination of VLDL level: By dividing the triglyceride level on 5.

Results:

1- Determination of percentage of cardiac specific troponin:

Table 1 : Demonstrate the average percentage of troponin level during the 30 days of this study ± 2 SD at (p<0.05).

N.S = not significant

This table shows a dramatic reduction of cardiac troponin when omega- 3 used and this result is

group	Within first 2 hours	At 6 hours	At 12 hours	At 24 hours	At 48 hours	At day 30	Q- square test
Patient not received omega- 3 fatty acid	100±5.2	90±4.3	90±5	87±6	86±5.6	80±7	N.S
Patient received omega- 3 fatty acid	100±5.3	84±4.7	62±3.5	45±2.5	35±4.1	15±1.2	Highly significant ***

consistent with that obtained from Davidson et al ⁽¹⁷⁾ and this can be explained by that omega- 3 fatty acid had an anti-oxidant properties that can be reduce free radicals induced myocardial injury

2- Determination of creatin kinase level:

Table 2: Elicit the mean creatin kinase level in unit per liter during the 30 days of this study ± 2 SD at (p<0.05).

group	Within first 2 hours	At 6 hours	At 12 hours	At 24 hours	At 48 hours	At day 30	T- test
Patient not received omega- 3 fatty acid	65±12	72±10	76±8	80±11	78±10.5	82±12.9	N.S
Patient received omega- 3 fatty acid	66±11.2	68±11	72±13.5	64±9.8	52±9.9	41±10.7	Highly significant **

This table ensure the cardioprotective effect of omega- 3 fatty acids in patients with an acute attack of cardiac ischemia which may be owing to anti- oxidant properties and cholesterol lowering effects and this conclusion agree with the result obtained from Bucher et al study ⁽¹⁸⁾.

3- Determination of serum triglyceride level:

Table 3: Shows mean triglyceride level (in mg\dl) \pm 2 SD along 30 days of treatment with 0 omega-3 at (p<0.05).

group	Within first 2 hours	At 6 hours	At 12 hours	At 24 hours	At 48 hours	At day 30	T- test
Patient not received omega-3 fatty acid	98 \pm 44	94 \pm 46	95 \pm 43	98 \pm 53	93 \pm 58	92 \pm 48	N.S
Patient received omega-3 fatty acid	96 \pm 42	97 \pm 45	90 \pm 56	91 \pm 34	89 \pm 37	50 \pm 26	Highly significant***

A productive results were originated from this study suggesting that omega- 3 fatty acid can reduce triglyceride level thereby reduce the risk of progression of present ischemia and to minimize subsequent complications of it due to direct lipid lowering properties of the tested agent . Our findings go with a similar one obtained by Stone et al ⁽¹⁹⁾.

4- Determination of very low density lipoprotein (VLDL) cholesterol:

Table 4: Clarify the mean level of VLDL in mg\ dL \pm 2 SD at (p <0.05) during the 30 days of this study.

group	Within first 2 hours	At 6 hours	At 12 hours	At 24 hours	At 48 hours	At day 30	T- test
Patient not received omega- 3 fatty acid	55 \pm 1.3	48 \pm 2.1	51 \pm 2.2	52 \pm 3	49 \pm 1.15	50 \pm 2	N.S
Patient received omega- 3 fatty acid	60 \pm 3.1	59 \pm 2.5	61 \pm 2.7	55 \pm 3.1	40 \pm 2.1	5 \pm 1.4	Highly significant ***

A remarkable reduction in serum VLDL level was seen when omega- 3 fatty acid used in this study which in turn reflect an antagonizing potential against myocardial ischemia that is similar to that found by McKenney et al ⁽²⁰⁾.

Conclusion:

From the previous data collection, it is very clear that omega- 3 fatty acid had a very affective as cardio protective to minimize the complications and disability that produced by an attack of myocardial ischemia suggesting that this substance can be used publicly as an adjuvant therapy to diminish the signs, symptoms, and dangerous complications of myocardial attacks.

Recommendations:

We recommend that further trials must be performed to assess further effects of omega- 3 fatty acid to protect the heart weather in a direct or indirect way and to evaluate the mechanism(s) by which this substance act as a protective agent.

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