ORIGINAL REPORT

Efficacy of Core Decompression of Femoral Head to Treat Avascular Necrosis in Intravenous Drug Users

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Abstract- Core decompression (CD) of the femoral head is one of the effective treatments of avascular necrosis (AVN), especially in the early stages of the disease. To investigate further the value of CD in treating the AVN, this study was performed on patients with symptomatic AVN with different etiologies who were treated with CD. This study was carried out on 25 patients (with the total number of 37 femoral head) who were diagnosed AVN using X-Ray and MRI. The CD treatments for these patients were started soon after the diagnosis. The results were considered as a success if there was no progression of disease confirmed by X Ray or no subsequent operation was required. Modified Ficat staging was used to record changes before and 2 years after CD treatment. Twenty five patients were participated in this study in which 68% (n=17) were female, 32% (n=8) were male, and the average of the age of the patients were 29.58±4.58. Eight of these patients had systemic lupus erythematous (SLE) (32%), 4 rheumatoid arthritis (RA) (16%), 3 with kidney transplant (12%), 1 Takayasu's vasculitis (4%) and 1 Wegner vasculitis (4%). Eight of patients had a history of intravenous injection of Temgesic (32%). In patients using Temgesic the changes in Modified Ficat staging were significantly different before and after CD treatment (P=0.03) in comparison with other groups. And in all 8 Temgesic users AVN progressed to the stage 3 and 4 after CD treatment. This study demonstrated that CD treatment to prevent the changes in the femoral head has been more effective in patients with collagen vascular diseases and kidney transplant than patients using intravenous Temgesic. These patients, in spite of early operation, showed no benefit of CD to prevent the changes in the femoral head.

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Introduction

Non-traumatic AVN of the femoral head is one of the major cause of disability in young patients and its progression usually leads to impaired joint function (1). It also remains a difficult therapeutic problem (2). A variety of diseases associated with osteonecrosis has been proposed as an etiology for AVN. Treatment with corticosteroid has been added to the routine treatment of these diseases such as: rheumatologic diseases, hypercholesterolemia, hypertriglyceridemia, excessive alcohol use, caisson disease, sickle cell disease, Gaucher disease , and radiotherapy for malignancies (1,3). AVN is mediated by intraosseous hypertension followed by intramedullary venous stasis, edema, necrosis, fibrosis and infarction (2).

CD is one of the attractive and effective techniques most frequently utilized to attempt to delay the joint destruction and save the osteonecrotic femoral head that may necessitate hip arthroplasty. This could decrease the intraosseous pressure and improving venous return and promoting the vascularization of the necrotic area of the femoral head, in the early stages of AVN (1,2,4,5). However, the results of CD that were reported have not been equaled by investigators (2).

Considering the important impact of intravenous drugs on AVN, there is a gap in the literature regarding the effects of intravenous drugs and AVN. The possible

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effects of AIDS and antiretroviral drugs have been mentioned by some authors. Temgesic is the trade name of Buprenorphine which is found in heroin and corticosteroid. These drugs have been registered as illegal in Iran but used as intravenous drug by addict patients.

In this study, based on modified Ficat staging, we assessed the outcome of CD therapy on AVN patients with different etiologies with emphasis on Temgesic use.

Materials and Methods

In this follow up study, we studied retrospectively a series of 37 femoral heads of 25 patients with osteonecrosis treated by CD between January 2009 and November 2010 in Shahid Sadoughi Teaching Hospital, Yazd, Iran; with an average follow-up of 2 years (2 to 26 months). The indications for CD were pain in the hip and AVN appearance on MRI and radiographs. Patients with stage III and IV were not treated by CD. The diagnosis of AVN was made using anteroposteriorly and lateral hip X Ray and MRI scans. We searched for etiologic factors. We examined the epidemiological and clinical features, the laboratory findings, comparing the reason and outcome of cases requiring secondary hip replacement. All surgical procedures were similar and performed by one orthopedic surgeon. The coring procedures were performed under C arm control with a simple type core decompression needle. Postoperatively, the patients were managed with partial weight bearing with the use of two crutches for eight weeks.

Radiographs were taken and analyzed one radiologist, when the patient entered the study and at 3,6,12 and 24 months thereafter. The AVN of the hip was classified by modified Ficat staging system (6).

The parameters used for analysis were as follow: age, gender, presumed risk factors, use of intravenous Temgesic and modified Ficat staging before and after CD, success rate and efficacy of CD. When no hip progression was observed on X-Ray and no subsequent operation needed, the results were considered successful. The efficacy of CD measured in terms of decreased proportion of patients showing radiographic progression to collapse.

Results

Our patients were 17 women (27 hips) and 8 men (10 hips) who had a mean age of 29.58±4.58 years (range, 22-41 years) at the time of decompression. The average duration of symptoms before CD was 3.52±1.45 months. The presumed risk factors included the use of steroids in 25 patients (37 hips) due to systemic lupus erythematosus in 8 patients (11 hips), rheumatoid arthritis in 4 patients (5 hips), Takayasu's arteritis in 1 patient (2 hips), Wegener's granulomatosis in 1 patient (2 hips) and kidney transplantation in 3 patient (5 hips) and intravenous Temgesic abuse in 8 patients (12 hips). Before CD, the patients were classified according to the modified Ficat staging system into stage I (10 hips), stage IIA (27 hips) and 12 patients had bilateral lesion. After CD, 13 hips were classified as modified Ficat stage IIA, 8 hips as stage IIB, 11 as stage III and 5 were classified as stage IV (Table 1). In 8 patients (32%), no changes were seen in their staging. In 5 patients (20%) there was only one stage increase after CD. Two patients (8%) showed changes from stage IIA to IV and in another 2 patients (8%) from IIA to 3. All 8 patients using Temgesic (32%) changed to stage III and IV after operation. Stage changes in patients using Temgesic before and after CD reached significance (P=0.03) in comparison with patients with collagen vascular disease and kidney transplant.

In this study, we find a strong significant association between presumed risk factors and successful results of CD. No significant association was found between sex and age of the patients and results of CD. After CD no complications were observed.

Table 1. Modified Ficat staging of the femoral head AVN.

Stage	Description	Radiographic Sign
I	Preradiographic	None
IIA	Before flattening or sequestrum formation	Diffuse porosis, sclerosis or cyst
IIB	Transition	Flattening, crescent sign
III	Collapse	Broken counter, sequestrum, normal joint space
IV	Osteoarthrosis	Flattened contour, decreased joint space, collapsed head

Association between stage before and after CD was evaluated using software SPSS version 16 and chi-square test. P values less than 0.05 considered statistically significant.

Table 2. Results of CD based on presumed risk factor.

	No of patients	No of the femoral head	Stage before CD			Stage after CD				Success Rate
			I	IIA	IIB	IIA	IIB	III	IV	
SLE	8	11	2	9	0	4	5	1	1	3/11(27.28%)
RA	4	5	3	2	0	4	0	1	0	2/5(40%)
KT	3	5	1	4	0	1	3	0	1	1/5(20%)
TA	1	2	2	0	0	2	0	0	0	1/2(50%)
WG	1	2	0	2	0	2	0	0	0	2/2(100%)
Temgesic	8	12	2	10	0	0	0	9	3	0/12(0%)
Total	25	37	10	27	0	13	8	11	5	9/37(24.32%)

CD=Core Decompression; SLE=Systemic Lupus Erythematous; RA= Rheumatoid Arthritis; KT= Kidney Transplantation

TA= Takayasu's Arteritis; WG= Wegener's Granulomatosis; *P* Value=0.03

Discussion

There is a gap in the literature regarding the possible effects of intravenous drugs, especially Temgesic and AVN. The possible effects of AIDS and antiretroviral drugs have been mentioned by some authors. This study showed a great dependency of efficacy of CD on the etiology of AVN. In this study, Temgesic users had no clinical improvement and success rate was 0% while the success rate in other patients reached up to 36%. On the other words, in this study, we found a strong significant association between presumed risk factors and successful results of CD. This is in disagreement with Smith SW et al study who found no significant association between risk factors and results of CD (2). Success rate in our study was 9/37 (24.32%) but in Smith SW study was 29% (2). Ficat found clinical improvement in 90% and no radiographic progression in 79% of patients who were treated with CD in stage I and II, for nine years and six months follow up (6). Steinberg et al reviewed result of osteonecrotic hip that treated nonoperatively and found progression in 92% of patients at an average of 21 months follow up (7). Published success rate were from 0 to 100% and rate of complications was from 0.7 to 15% (2). Disparities in the selection of patients, classification, operative details, clinical follow up and the definition of success rate make it difficult to interpret results. Smith SW et al found success rate 59% for stage I, 34% for stage IIA, 4% for stage IIB and 0% for stage III, thus these data showed that CD may not be warranted for patients in whom the stage of AVN of the femoral head higher than IIA (2). This stage can be considered a presumed risk factor for AVN.

Temgesic is the trade name of Buprenorphine which its products in Iran are heroin and corticosteroid. They are registered as illegal drugs but are used as intravenous drug by addict patients.

There is also considerable disagreement as to the success rate of CD, how it might help, and the level of influence of various patient factors such as alcohol abuse, smoking, corticosteroid use, etiologic factors such as SLE, sickle cell anemia and radiographic lesion characterizations such as the presence or degree of collapse , lesion size or location (5).

There is a gap in the literature regarding the effects of intravenous drugs use and AVN. Several recent reports have suggested a possible link between AVN and the use of intravenous drug use (8-10). The possible effect of AIDS and antiretroviral drugs by some authors has also been mentioned. In this study, AVN is perhaps as a result of Temgesic component specially dexamethasone. AVN occurs in 8 to 10% of patients exposed to corticosteroid therapy (11). In patients with Temgesic usage, it is difficult to separate the effects of corticosteroids on bone from those of the other possible factors such as excessive alcohol intake. On the other hand, corticosteroids used in these patients can cause AVN although the dose and duration of Temgesic abuse are shorter than corticosteroid used for another reasons to pose the only risk for AVN in these patients. However, there are two case reports of AVN linked to short-course corticosteroid therapy (12, 13), which makes it difficult to state that whether short courses of steroid therapy truly pose a risk for AVN (14). Long-term corticosteroid therapy, however, has been the likely risk factor for AVN in our patients, in concordance with previous reports. A review of 31 AVN patients with AIDS revealed that the injection drug abusers were 34% of their population. It has shown that the incidence of AVN in HIV patients is 45 times greater than in the normal population (15, 16). On the other hand, it is unlikely that Temgesic abuses have increased other risk factors for AVN. Matos MA et al found an association between intravenous drug abuses with osteonecrosis. Intravenous drug users had an odds ratio of 16.87.

Intravenous drug abuse is commonly associated with deep vein thrombosis and it may lead to bone necrosis and infection (17). In conclusion, we concluded that the outcome of CD therapy of AVN is associated with poor prognosis in patient with intravenous Temgesic abuse. Because of the limitations of this study, we are unable to confirm the role of Buprenorphine itself as a risk factor for AVN outcome. It is likely that the presumed risk factors of AVN in patients with intravenous Temgesic abuse is multifactorial and further study of the role of risk factors is required. It is recommended that, details of the alcohol consumption, drug usage and prior steroid treatment obtain directly by interviewing the patients.

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