THE NATURAL COURSE OF GONARTHRITIS

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ABSTRACT

In order to learn how pathological changes and symptoms of gonarthrititis progress over a long period of time, we selected those cases having a history for over 10 years, in which the patient had not received surgical operation, as the subjects of our investigation.

The subject cases including 96 joints were investigated to find out the correlations between the progress of pathological change and such factors as sex, age, obesity, occupation, way of living, type of toilet, hospital visit, or FTA (femoro-tibial angle) etc.

The results were as follows:

- (1) Changes at the medial condyle get most easily aggravated, which are followed by those occurred at the patellofemoral joint and the aggravation is the least in changes at the lateral condyle.
- (2) Obesity as opposed to normal makes the grade of gonarthrititis worse.
- (3) There are no correlations between aggravation of gonarthrititis and age, sex, way of living or occupation.
- (4) In advanced cases, patients use western style toilets.
- (5) In advanced cases, patients visit hospital more frequently.

INTRODUCTION

Along with aging of the population, the incidence of degenerative gonarthrititis is showing an increasing tendency. The majority of such cases is occupied by secondary gonarthrititis from various causes.

As to the treatment of gonarthrititis, there are only few patients to whom surgical operation is applicable and the rest of them receive the so-called conservative treatment such as medication, injection or physical therapy, etc. For the conservative treatment of gonarthrititis, it is very important to know how the pathological change of the bone and joint further develops over a long period

of time.

From the above viewpoint, we have carried out an investigation to study: (1) what kind of roentgenographic change would occur; (2) what factors would affect the progress of gonarthrosis in the natural course of the conservative treatment of the patient.

MATERIALS AND METHODS

The cases investigated were 26 of male, and 56 of female, amounting to 82 in total, which were classified by laterality as follows: 15 bilateral cases, 43 right joints and 54 left joints, 97 joints in total. The average age at the time of investigation was 69 with the range from 51 to 85 years (Table 1).

The distribution by age indicated 20% in fifties, 80% in over 61. Number of patients over 71 years were 38 including 46 joints representing 46.6% of the total (Table 2).

Table 1
Materials

(1) Sex	(2) Laterality (97 Joints)	(3) Age
Male 26	Bilateral 15	51~85 yrs. Ave. 69 yrs.
Female 56	Right 43	
	Left 54	

Materials are 82 cases of 97 joints over 51 years.

Table 2
Age and cases

	Cases	Joints
51~60 yrs.	16	18
61~70 yrs.	28	33
71~	38	46

The follow-up periods ranged from 10 years to 17 years and there were 59 joints followed up for 10-13 years, and 28 joints were followed up for 14 to 17 years. The average was 12 years (Table 3).

The evaluation of roentgenographic changes was made by the chart shown in the Table 4. Pathological (morbid) changes investigated included those of sclerosis, cyst, eminentia spur, spur, condyle flattening, patella concavity, narrow-

Table 3
Follow up period

Years	Joints
10	12
11	17
12	24
13	16
14	8
15	11
16	4
19	5

ing of joint space, etc. The A-P view depicted changes on the medial and lateral sides of the femur and tibia, and the lateral view took changes occurred at the patella and femur for our investigation.

For the purpose of scoring the changes, those with no change were given 0 point, slight change, 1 point, moderate, 2 points and advanced, 3 points. The

Table 4
Chart

	A-P View				Lateral View	
	Lateral		Medial		FT joint	
	Femur	Tibia	Femur	Tibia	Patella	Femur
Sclerosis						
Cyst						
Eminentia Spur					—	—
Spur						
Condyle Flatterning						
Patella Concavity						
Narrowing of Joint Space						
SCORE						
GRADE						

SCORE 0: No charge
2: Modert

1: Slight
3: Advanced

GRADE 0: ~2
2: 7~10
4: 15~22

1: 3~6
3: 11~14

points were added for the grading. Grading consisted of 5 grades from 0 to 4, in which Grade 0 included points up to 2, Grade 1 from 3 to 6 points, from 7 to 10 points fell under Grade 2, and Grade 3 covered from 11 to 14 points and Grade 4 from 15 to 22 points (Table 4).

RESULTS

With respect to the lateral condyle, 40 joints which represented 56% of the total did not show any change from Grade 0 given at the initial check, and there were 32 points deteriorated to Grade 1 or 2, however, there was none that indicated further deterioration to Grade 3 or 4.

With respect to the lateral condyle, there was no joint the grade of which was aggravated in the group of Grade 1, 2, 3 or 4 during the course of treatment.

On the other hand, the study of the grade change of the medial condyle indicated that the aggravation rate in the group of Grade 0 was comparatively low, however, there were many, the grades of which deteriorated in the time course in each of the groups having initial Grades 1, 2, 3 and 4. In other words, aggravation of the pathological change at the medial condyle was most significant.

In checking the patello-femoral joint, there was nearly no joint the grade of which was aggravated in the group of Grade 0. However, groups of Grades 1, 2, 3 and 4, tended to show aggravation of moderate degree. The deterioration of grade shown by the patello-femoral joint situated halfway between those shown by the medial condyle and the lateral condyle.

In other words, the results indicated that aggravation of the pathological change was most severe at the medial condyle which was followed by that at the patello-femoral joint and the lateral condyle showed the least aggravation (Table 5).

Taking initial letters of the 3 components i.e., medial condyle, lateral condyle, patello-femoral joint, joints showing the highest grade were classified into 3 types such as M, L and PF, according to the component where such highest grade was marked. Then pathological changes showing the highest and second highest grades were classified into 3 types, namely ML, MP and LP, and finally Type LMP was given to those which indicated a similar degree of deterioration at all the 3 components, so that they were divided into 7 types in total.

Fig. 1 shows natural changes made by the above types. At the time of the first check, there were 79 cases (joints) of LPM, which was the largest number, Then 10 cases (joints) of Type M followed the above. In investigating changes discovered at the final check, increases of Type M and Type MP were conspicuous.

Type LMP with Grade 0 and 1 at the time of the first check indicated the largest number of joints which can be said the image of early change of gonarth-

Table 5

The aggravation of the pathological change is most severe at the medial condyle

Natural Change by Type

First Check	Final Check	Lateral	Medial	PF
Grade 0	Grade 0	40	12	38
	1	30	25	26
	2	2	4	8
	3	0	1	0
	4	0	1	0
1	1	13	6	3
	2	6	11	11
	3	2	10	4
	4	0	5	1
2	2	1	0	0
	3	2	1	3
	4	0	12	2
3	3	1	1	0
	4	0	7	1
4	4	0	1	0

Fig. 1 The natural change shows the highest in the medial type.

ritis. How further changes occurred to the early change of the LMP group is explained in the Fig. 1.

Although 37 joints made no change, one can see the remaining 32 joints changed to 9 LMP joints, 12 M joints, 7 MP joints and 4 LM joints (Fig. 2).

Low Grade Group at First Check

Fig. 2 Shows how changes took place in the low grade group.

Fig. 3 similarly shows how changes took place in each type of joints with Grade 2 or higher. Ten joints of Type M moved to Type M of aggravated grades and 10 joints of Type LMP became 5 Type M joints, 2 Type MP joints and 5 joints of Type MP advanced their grades in the same type.

We tried to find out factors which could have effects on aggravation of gonarthrosis, and relations between progression of grade and obesity, sex, occupation, way of living, toilet, frequency of hospital visit were determined by the Chi square test at less than 5% of permissible error (Table 6).

The average body weight at the first check was 55.0 kg which changed to 53.5 kg at the final check indicating a slightly decreasing tendency. The obesity was calculated by the formula shown in the Table 7 and the 'normal' represented $\pm 10\%$, the overweight, 10–19% increase and the obesity indicated an increase over 20%. More than 80% of the joints with gonarthrosis belonged to the group of overweight or obesity at the first check, however, the percentage went down to 67% in the time course.

Natural change of the grade by obesity was studied in 41 joints of obesity

Natural Change of the Type

Fig. 3 Shows how changes took place in the joint with grade 2 or higher.

Table 6
Assessment items

1. Obesity Group and Normal Group	5. Way of Living
2. Male and Female	6. Toilet
3. Age	7. Frequency of Hospital Visit
4. Occupation	8. F.T.A.

and 18 of normal. Grade differences are indicated (plotted) on the abscissa and the vertical axis indicates the percentages to the 18 normals and 41 obesities. As the two groups of line graphs on the right side show, those with 2-grade-up aggravation were 11% in the normal group, and 44% in the obesity group, suggesting more aggravated joints in the obesity group (Fig. 4).

Natural change of the grade by sex was examined in 33 of male and 64 of female joints. The vertical axis expresses the percentages to the total and the cross axis indicates the grade differences. As is seen in the Fig. 5, there was almost no difference between men and women indicating progression of gonarth-

Natural Change of the Grade by Obesity

Fig. 4

Natural Change of the Grade by Sex

Fig. 5 The progression of gonarthrititis has nothing to do with sex.

Table 7
Body weight

Ave. at First Check 55.0 kg		
Ave. at Final Check 53.5 kg		
Standard Body Weight = (Height - 100) × 0.9		
$\frac{BW}{\text{Standard BW}} \times 100 = \text{Obesity (\%)} \quad \begin{matrix} \text{Normal} & \text{within } \pm 10\% \\ \text{Over Weight} & 10 \sim < 20\% \\ \text{Obesity} & 20\% \sim \end{matrix}$		
	First check	Last check
Less	1 Jts	4 Jts
Normal	26	31
Over	26	25
Obesity	41	37

ritis has nothing to do with sex.

Similar to the above finding on sex, the result of comparison of grade aggravation in 58 joints from 40-60 year-old patients and 39 joints from 60-75 year-old patients, revealed no correlation between the progress of the illness and age.

The study of natural change of the grade by occupation was carried out by

Natural Change of the Grade by Occupation

Fig. 6 There is no correlation in the grade aggravation between the light and heavy labor.

the comparison of the light labor and heavy labor groups. Fifty joints came from the housewife or light labor group and 49 joints from the farmer or heavy labor group. As is seen in the slide, here again no correlation was found in the grade aggravation between the light and heavy labor groups (Fig. 6).

Japanese style living and western style living was compared in order to learn if there was any effect on natural change of the grade by way of living. However, no significant difference in grade deterioration was discovered between 59 joints of patients who lived only in Japanese style rooms and 38 of those lived in western style rooms (Fig. 7).

Fig. 7 There is no significant difference in the grade deterioration by the way of living.

Seventy-nine joints of patients who used Japanese style toilets and 18 joints of those who used western style toilets were investigated with respect to natural change of the grade by toilet. Two-grade-up aggravation was found in 56% of the western style toilet group while it was only 30% by the Japanese style toilet group. However, the percentage of the western style toilet group included those who switched to the western style toilet as the result of aggravated symptoms. The above can be endorsed by the fact that symptoms found deteriorated in the western style toilet group as against the Japanese style toilet group based on the examination of ROM, pain and capability of Japanese squatting (Fig. 8).

The correlation between the frequency of hospital visit and grade aggravation is shown in Fig. 9. Joints examined consisted of 23 joints from the "once

Natural Change of the Grade by Toilet

Fig. 8 The more symptom aggravation, the more switch to the western style toilet.

Natural Change of the Grade by Hospital Visit

Fig. 9 The higher the grade aggravation, the higher the frequency of hospital visit.

in a while" group, 50 from the "sometimes" group and 20 from the "often" group. The higher the grade aggravation, or the stronger the symptoms, the higher the frequency of hospital visit.

DISCUSSION

In analysing scientific data, it is necessary to satisfy various questions such as if the subject cases were selected properly, or the assessment used in the study is one of those that have been approved publicly.

In the case of clinical research, however, it has to be subjected to various restrictions which are not found in animal experiments. Therefore, in the present study, analyses should be interpreted bearing the following in mind:

(1) Cases taking the natural course mean those treated conservatively, but not untreated ones.

(2) Analyses of changes in the time course do not include analyses classified by age or grade, but a comparison was made between the cases having passed over 10 years and the first check.

(3) The on-set was assumed as the first check.

(4) For scoring and grading, the preliminary assessment of the Keio Knee Society was used.

Dr. Iseki, the co-author of the present article, reported clinical analyses of 3,216 cases of gonarthrosis in the *Journal of Orthopedic Surgery* (vol. 52, page 11, 1979), and we find it very interesting that in gonarthrosis cases, obesity, varus deformity, quadriceps muscle atrophy and patello-femoral osteoarthritis agreed with the biomechanical irritants affecting the clinical course of the case.

CONCLUSIONS

We made investigations of (1) changes in roentgenographic findings of gonarthrosis and (2) factors to give effects on its aggravation by observing 97 joints suffering from gonarthrosis over the follow-up periods ranging from 10 to 17 years and arrived at the following conclusions:

(1) Changes at the medial condyle get most easily aggravated, which are followed by those occurred at the patellofemoral joint and the aggravation is the least in changes at the lateral condyle.

(2) Obesity as opposed to normal makes the grade of gonarthrosis worse.

(3) There are no correlations between aggravation of gonarthrosis and age, sex, way of living or occupation.

(4) In advanced cases, patients use western style toilets.

(5) Patients of advanced cases visit hospital more frequently.

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