Summary

Osteoarthrosis (OA) is a common disorder of the temporomandibular joint (TMJ), and is frequently associated with internal disk derangement (ID). The course of OA and ID is usually described in three main stages. In the initial stage reciprocal clicking of the TMJ, indicative of a reducing disk displacement (RDD), is a major clinical sign. In this stage no or only slight signs of OA are radiographically visible. The second stage is characterized by restriction of movement due to a permanently displaced disk (PDD), frequently accompanied by pain. In this stage radiographically visible bony changes may become evident. Eventually, the range of motion may increase again due to stretching of the posterior disk attachments, and pain may subside. It has been suggested that a certain natural sequence of the signs and symptoms of the disorder exists. In the beginning clinical signs and symptoms dominate, later on followed by extensive radiographically visible bony alterations. Both the clinical and radiographical stages are thought to reach a stable end stage within a few years. It would be of great importance to both the patient and the therapist to learn whether these stages of so-called quiescence indeed are reached and, moreover, whether these stages are stable in the long run. The few available long-term investigations focussing on OA and ID describe the clinical course usually to last one to three years, followed by a gradual regression of symptoms. Ongoing radiographically visible changes lasted one to three years, terminating in a stable state of the TMJ disorder within the time-limits of the studies (not exceeding six years). More recent follow-up studies have shown that the initial stage of clicking may last for at least three years.

In order to obtain a more definite insight in the course and the prognosis of OA and ID a follow-up study over a longer period would be necessary. To the best of our knowledge, no longitudinal investigations on the course of TMJ OA and ID have been performed. Since with non-surgical treatment the anatomical relationships in the TMJ are not corrected or interfered with as such, the long-term status of TMJs treated this way may closest reflect the final end-stage in the natural course of TMJ OA and ID.

At the department of Oral and Maxillofacial Surgery of the University Hospital of Groningen, the records of 400 patients treated non-surgically 30 years ago have been preserved. With this material a follow-up study after a 30-year period could be performed. To exclude the possibility that clinical and radiographically visible signs, if any, in the TMJs of the patients simply would be a matter of ageing, an age-matched control group without previous or present symptoms of TMJ OA and ID were included in the study.

The aims of the study, which are pointed out in detail in Chapter 1 are in summary: 1. to evaluate whether both clinically and radiographically a long-lasting stable stage of quiescence with no or minor persisting symptoms is reached in the course of TMJ OA and ID; 2. to gain insight in the role of disk position and disk configuration in the course of TMJ OA and ID; 3. to investigate whether progression of the stage of RDD to the stage of PDD is inevitable in the long run.

In Chapter 2, the selection procedure and diagnostic criteria to create a well-defined group of patients with OA and ID are pointed out. The study design was first performed with 21 former patients and 21 control subjects of the same age who were free from previous and present symptoms of TMJ OA and ID. Thus, 30 years after being treated non-surgically for OA and ID, 14 women and seven men (mean age 60 years) were re-examined clinically and radiographically. The results of this examination were compared with those recorded before and after treatment 30 years ago, and with those of the matched control group (mean age 61 years). The number and degree of subjective and objective signs and symptoms had decreased, and was comparable to that of the controls. However, the patients reported significantly more often to expect pain and difficulty on opening the mouth wide. This was also reflected in the radiographically assessed TMJ mobility, which
had increased significantly over the years, but was still significantly less than that of the controls. The occurrence and extent of radiographically visible osteoarthrotic alterations increased over the years, and differed significantly from those of the controls.

Therefore, it was concluded that only few symptoms and clinical signs of OA and ID are found many years after treatment, although radiographic alterations may be extensive.

From the pilot study it appeared that the eldest patients were the cause of a high drop-out as a result of poor mental and physical conditions. To prevent this undesirable drop-out of patients, it was decided to recall only patients younger than seventy years of age. Additionally, patients younger than fifty years of age suffered 30 years ago most likely of juvenile OA, and were therefore also excluded of participation. Juvenile OA is a TMJ disorder which closely resembles OA and ID, but may not run the same course.

In Chapter 3 the long-term condition of TMJs treated non-surgically for OA and ID is evaluated. Ninety-nine patients (16 men and 83 women, mean age 58 years) with either RDD or PDD were submitted to a structured interview concerning previous treatment, masticatory function, and the presence of symptoms of TMJ OA and ID, and of complaints of the musculoskeletal system in general. A control group (8 men and 27 women, mean age 59 years) without complaints of the masticatory system, matching the patient group for sex, age, and state of denition, was included in the study to avoid simply documenting age-related TMJ conditions.

Satisfaction with the treatment outcome was high. Chewing ability of the patients did not differ from that of the controls, although patients more often expected pain and difficulty with opening the mouth wide. The main TMJ symptoms of the patients had decreased significantly, albeit patients reported joint noises more often than controls.

It was concluded that, despite some persisting symptoms, the non-surgical treatment approach of TMJ OA and ID provides long-lasting satisfactory subjective results and is well accepted by most of the patients.

In Chapter 4 the clinical course of TMJ OA and ID in the long run is evaluated. The 99 patients were re-examined 30 years after the original treatment. Results were compared with information obtained from the patients' clinical examinations before and few years after the original treatment, as well as with information from the clinical examination of the 35 control subjects. During the first years after treatment the main signs of OA and ID decreased significantly. In the next three decades very few changes were noticed. Clicking and crepitus were the most common remaining signs. These signs, however, did not appear to be bothersome to the patients. It was concluded that the disorder in question eventually reaches a state of quiescence. Thus, clinically, OA and ID has the tendency to "burn-out" within a few years, leaving no or only a few clinical residual signs.

The aim of Chapter 5 was to evaluate the long-term status of TMJs with OA and ID radiographically. Transcranial and transpharyngeal radiographs were made before (T1), two to four years after (T2), and 30 years after (T3) non-surgical treatment in 65 former TMJ patients. Of these patients, TMJs that were diagnosed 30 years ago with RDD (Group I, n=33) and TMJs that were diagnosed with PDD (Group II, n=43) were evaluated separately. To control the results for ageing, additionally 35 matched control subjects (Group III, 70 TMJs underwent the same radiographical examination.

The number and severity of radiographically visible degenerative changes had increased significantly from T1 through T2 to T3 in Group I as well as in Group II. The increase in these changes were not simply due to ageing, since in approximately three quarters of the TMJs in Group III no radiographically visible degenerative changes at all were found. At all occasions Group II showed significantly more and more severe changes than Group I. At T3, in Group I in 64% of TMJs no or only slight radiographically visible degenerative changes were observed, whereas in 86% of TMJs in Group II moderate to severe changes were observed. Persisting RDD in part of the TMJs in Group I
might explain this significant difference. Of the TMJs with moderate to severe radiographically visible degenerative changes at T1, in 79% no or only slight progression in the extent of these changes was seen between T2 and T3, indicating that a stable end stage may be reached eventually.

It was concluded that radiographically visible degenerative changes may fail to become manifest in TMJs with RDD in the long run, while such changes may be extensive in TMJs with PDD. Apparently, a radiographically stable end stage may be reached within a few years in the majority of cases.

In Chapter 6 the position and configuration of the disk on magnetic resonance (MR-) images in TMJs with a long history of OA and ID is described. Sagittal T1-weighted MR-images of 55 TMJs that were diagnosed with OA and ID about 30 years ago were made in closed and open mouth situation. On the MR-images the position and configuration of the articular disk were determined. For comparison a control group consisting of 15 asymptomatic TMJs without clinical signs of internal derangement or of other TMJ disorders were studied in the same way.

Anterior disk position was found in 92% of the TMJs with a history of ID. RDD was found in one third of these TMJs, while PDD was found in two thirds. In four TMJs no disk material was discernible. In one of the TMJs of the control group an asymptomatic PDD was found. Normal disk position was found in all other TMJs of the control group.

A biconcave disk configuration, which was considered normal, was found only in TMJs with normal disk position or with RDD.

We conclude that after 30 years of TMJ disk displacement the disk can be clearly determined on MR-images in most cases. If the disk becomes displaced permanently, its configuration will deviate from the normal biconcave configuration, and its anteroposterior length decreases. Convex and folded appearances of the disk are common in this situation. However, the disk usually maintains its biconcave configuration as long as the disk recaptures its position atop of the condyle during mouth opening, even if this situation lasts for several decades.

In Chapter 7 the clinical, radiographical and MR status of TMJs 30 years after non-surgical treatment for OA and ID is described. Of 46 former patients 55 TMJs with a history of OA and ID and 37 contralateral TMJs that were asymptomatic 30 years ago were examined clinically and radiographically. To visualize degenerative changes of the bony parts of the TMJ transpharyngeal and transcranial radiographs were made, to visualize disk position sagittal T1-weighted MR-images were made. For comparison TMJs of an age-matched control group without complaints of the masticatory system were examined in the same way.

Thirty years after the initial diagnosis of OA and ID the number of clinical signs in former patients did hardly differ from that of control subjects. However, radiographic signs were significantly more common and more severe in TMJs of former patients. A high percentage of OA and ID was evidenced on MRI in both TMJs with a history of OA and ID (91%) and the contralateral TMJs (73%). It appeared that OA and ID in the contralateral TMJs had developed asymptotically in most cases. None of the patients had required treatment for the contralateral TMJ, only one fourth of the patients had noticed symptoms. In the control subjects OA and ID was found in 23%. A significant correlation was found between disk position and the severity of radiographically visible degenerative changes of the TMJ.

It was concluded that 30 years after diagnosis clinical signs of OA and ID are scarce, although radiographic signs may be extensive. Bilateral OA and ID with one symptomatic and one asymptomatic TMJ is a common phenomenon. Moderate to severe radiographically visible degenerative changes may be the only sign of an underlying ID.

In Chapter 8 the results of the previous chapters are interrelated and the most remarkable results are highlighted.

This study shows that a significant decrease in the signs and symptoms of OA and ID can be obtained with non-surgical treatment.
- Summary -

Since the treatment result appeared to be independent of the treatment method applied, it was concluded that TMJ OA and ID runs a natural course ending in a clinically and radiographically long-lasting stable end-stage. The course of the disorder may be made more tolerable in many cases by gentle guidance the patient through the course with non-surgical treatment methods.

The initial stage of RDD does not inevitably lead to the intermediate stage of PDD, but may persist for several decades. If RDD persists, the TMJ is likely to show no or only slight radiographically visible degenerative changes even after 30 years. If RDD progresses to PDD radiographically visible degenerative changes may be extensive within due time.

Based on the results of the MRI-study, it was concluded that bilateral OA and ID is common, although clinical signs and symptoms of the disorder frequently develop only unilaterally. The asymptomatic course of OA and ID suggests that the TMJ has a remarkable adaptive capacity. Therefore, if treatment is needed, it should be directed towards the natural course of the disorder. In only a small part of the patients the disorder may not respond well to the non-surgical treatment approach. When the persistent symptoms have a significant negative effect on the patient's quality of life, TMJ surgery should not be withheld.

The present study design was not suitable for elucidating the possible keyfactors in the progression of RDD to PDD. The keyfactors in the subclinical development of TMJ OA and ID remained unclear as well. Therefore, further investigations with regard to these factors are necessary.