

TREATMENT OF INTRACAPSULAR FRACTURES OF THE FEMORAL NECK IN DENMARK : TRENDS IN INDICATIONS OVER THE PAST DECADE

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A questionnaire survey was set up in Denmark in 1996 including 40 orthopedic departments and 20 departments of general surgery, all dealing with the treatment of intracapsular fractures of the femoral neck. The aim of the survey was to investigate whether the treatment of these complex fractures in Denmark followed the international standard, the "gold standard", recommended in the recent international literature.

A shift in the treatment was noted, as compared with an earlier questionnaire survey in 1988, with more orthopedic departments performing a graduated treatment with respect to the age of the patients and fracture grade (Garden class). That is : a) nondisplaced fractures, b) displaced fractures (b.1 below 75 years and b.2 above 75 years).

Cannulated screws/pins were more commonly used in Garden I and II fractures (non displaced fractures) and in Garden III and IV fractures (displaced fractures) in patients below 75 years. Hemiarthroplasty/arthroplasty were more commonly used in the older age group, above 75 years, in displaced fractures (Garden III - IV). It is concluded that a shift in the treatment of these fractures has occurred, especially in orthopedic departments. One reason for this may be an increasing number of orthopedic specialists with experience in arthroplastic surgery, making it possible to perform and/or supervise younger surgeons in this procedure. Another reason must be an increasing awareness among orthopedic specialists in Denmark that complication rates in osteosynthesis of the displaced fractures (Garden III - IV) have been too high.

Keywords : questionnaire survey ; femoral neck fracture ; internal fixation ; hemiarthroplasty ; arthroplasty.
Mots-clés : enquête ; fracture du col fémoral ; ostéosynthèse ; hémi-arthroplastie ; arthroplastie.

The treatment of intracapsular fractures of the femoral neck (IFFN) has developed rapidly, internationally (3-5, 13, 15, 18, 19, 25) as well as in Denmark (6-8, 10 - 12, 14, 21, 24), since Smith - Petersen in 1931 introduced the three-flanged nail in the treatment of these fractures. The first operation in Denmark using this method was performed in Soenderborg by a general surgeon, Johannes Ibsen, in 1933.

In Denmark and Scandinavian countries IFFN has usually been treated with internal fixation. The orthopedic speciality was formerly a part of general surgery, and it became an individual specialty only in the sixties. In the seventies arthroplastic surgery in hip replacements expanded as the number of orthopedic departments increased.

The treatment of IFFN usually took place in departments of general surgery, with only a few orthopedic specialists supervising the younger surgeons.

The number of patients sustaining an IFFN is increasing rapidly, varying from exponential (2-16) to a more steady increase, owing to an increasing number of elderly people in the population (9).

The surgical treatment of IFFN has varied over time (3-8, 10-15, 17-21, 24, 25), and in some countries such as Denmark, the type of treatment

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depended on whether it was performed in a specialized orthopedic department or a department of general surgery (7, 8).

In the recent international literature (10, 15, 19, 25) the "gold standard" in treating IFFN approximates the following criteria :

1. Cannulated screws/hip pins in all Garden I and II fractures, and even Garden III and IV fractures in patients below 75 years ; alternatively a sliding screw and plate with an additional screw to improve rotational stability.
2. Patients above 75 years are treated with hemiarthroplasty/arthroplasty (cemented/hybrid).

I found it of interest to investigate the present surgical strategy of treatment of IFFN in Denmark, to compare the observations with those in a former investigation from 1988 (8) and to evaluate whether the increasing specialization (more specialized orthopedic departments and surgeons) has resulted in a concept in the treatment close to the international "gold standard".

MATERIALS AND METHODS

According to the Department of Health's "Virksomhed ved Sygehuse i 1994" (23) a questionnaire form was sent to 40 departments of orthopedics and 20 departments of general surgery.

The questions to the departments were as follows :

1. Type of department ?
2. Cannulated screws/hip pins for all patients with an IFFN ?

3. Sliding screw and plate for all patients with an IFFN ?
4. Does the department make a graduated treatment depending on age and fracture type (Garden class) ?
5. Are Garden I fractures operated primarily or only following secondary displacement ?
6. Are Garden II fractures operated with cannulated screws/hip pins, or sliding-screw and plate with or without an additional screw to improve rotational stability ?
7. In Garden III fractures : a) graduation in the treatment according to age, b) cannulated screws/hip pins, sliding screw and plate or c) hemiarthroplasty/ arthroplasty ?
8. In Garden IV fractures : as in Garden III fractures ?
9. Are all Garden III and IV fractures treated with hemiarthroplasty/arthroplasty ?
10. Another combination ?

RESULTS

Of all the questionnaires, 53 (90%) were answered : 39 of 40 (96%) from departments of orthopedics and 14 (70%) from departments of general surgery.

Concerning graduation in the treatment, two of the orthopedic departments and none of the departments of general surgery used only a sliding screw and plate. Five departments in each category used only cannulated screws/hip pins for all IFFN's. All other departments used a graduation in the treatment : 32 of 40 (80%) departments of orthopedics and 9 of 20 (45%) departments of general surgery (table I).

Table I. — Graduation in the treatment of IFFN : in 1996, 80% of the orthopedic departments and 45% of departments of general surgery made a graduation in the treatment of IFFN

	Graduation in the treatment of IFFN			Total number answering the survey	Total number of departments
	Sliding screw and plate for all patients	Cannulated screws / hip pins for all patients	Graduation in the treatment		
Department of orthopedics	2	5	32	39	40
Department of general surgery	0	5	9	14	20
Total	2	10	41	53	60

Garden I fractures (table II)

In departments of orthopedics all patients had surgery in 28/40 (70%) and in 9/40 (22.5%) when secondary displacement occurred. Five departments used a graduation, with patients below 75 years always undergoing surgery.

In 4/20 (20%) departments of general surgery patients always had surgery and in 7/20 (35%) departments, patients underwent surgery when secondary displacement occurred. Two of the departments made a graduation in the treatment.

Garden II fractures (table II)

In 35/40 (87.5%) departments of orthopedics, patients had surgery with cannulated screws/hip pins, and only few departments used more than 2 screws. Four departments (10%) used a sliding

screw and plate; an additional screw was used in two departments.

Nine out of 20 (45%) of the departments of general surgery used cannulated screws/hip pins and again few departments used more than two screws.

Three departments used only a sliding screw and plate, one of these with an additional screw.

Garden III fractures (table III)

Twenty-six out of 40 (65%) of the orthopedics departments treated patients below 75 years with cannulated screws/hip pins and patients above 75 years with hemiarthroplasty in 23 departments, or total cemented arthroplasty in 3 departments.

Two out of 40 (5%) of the departments used a sliding screw and plate in patients below 75 years, and one of these offered a hemiarthroplasty

Table II. — The treatment of nondisplaced IFFN, Garden I and II, in 1996 and 1988

		Orthopedic departments	Departments of general surgery	Investigation in 1988
Garden I fractures	Always operated	28 (70%)	4 (20%)	24%
	Operated when displaced	9 (23%)	7 (35%)	
Garden II fractures	Cannulated screws/hip pins	35 (87.5%)	9 (45%)	Respectively 61% and 38%
	Sliding screw and plate	4 (10%)	3 (15%)	Respectively 32% and 62%

Table III. — The treatment of displaced IFFN, Garden III in 1996. In 1988 displaced IFFN, Garden III and IV, were counted as one. Orthopedic departments used cannulated screws/hip pins in 48% of the cases. A sliding screw and plate was used in 39% and 13% always used arthroplasty. In departments of general surgery cannulated screws/hip pins were used in 39% of cases; 52% used a sliding screw and plate, and 10% used always a hemiarthroplasty

		Orthopaedic department.	Department of general surgery
Garden III fractures	Cannulated screws/hip pins — hemiarthro-/arthroplasty (graduation in treatment)	26 (65%)	5 (25%)
	Sliding screw and plate — hemiarthro-/arthroplasty (graduation in treatment)	2 (5%)	4 (20%)
	Cannulated screws/hip pins (all)	8 (20%)	4 (20%)
	Sliding screw and plate (all)	3 (7.5%)	1 (5%)

and one a total cemented arthroplasty to patients above 75 years.

In the departments of general surgery, 5/20 (25%) used cannulated screws/hip pins in patients below 75 years, and two of these used hemiarthroplasty in patients above 75 years. The last 3 departments performed no hemiarthroplasty/arthroplasty and referred patients above 75 years to an orthopedics department.

Four out of 20 (20%) departments offered a sliding screw and plate to patients below 75 years, and patients above 75 years had a hemiarthroplasty.

In 4/20 (20%) of the departments all patients were offered cannulated screws/hip pins, and in one department all were offered a sliding screw and plate.

Garden IV fractures (table IV)

Twenty-three out of 40 (57.5%) of the departments of orthopedics offered patients below 75 years cannulated screws/hip pins, and 19 of these departments offered patients above 75 years a hemiarthroplasty and four departments a total cemented arthroplasty.

Four out of 40 (10%) of the departments offered patients below 75 years a sliding screw and plate, three of these offered patients above 75 years a hemiarthroplasty, and one a total cemented arthroplasty.

Seven out of 40 (17.5%) of the departments offered all patients cannulated screws/hip pins and three (7.5%) a sliding screw and plate.

In 4/20 (20%) of the departments of general surgery patients below 75 years were offered cannulated screws/hip pins, and one of these departments offered patients above 75 years a hemiarthroplasty. The three remaining departments did not perform hemiarthroplasty/arthroplasty and referred these patients to departments of orthopedics. Five out of 20 (25%) of the departments offered patients below 75 years a sliding screw and plate and patients above 75 years a hemiarthroplasty. In two (10%) of the departments all patients were offered cannulated screws/hip pins independent of age, and none of the answering departments used a sliding screw and plate.

DISCUSSION

Internal fixation is preferred in Scandinavia (20, 22). Only a few studies have compared internal fixation and hemiarthroplasty in a prospective randomized study. Søreide *et al.* (20) found that internal fixation was less time-consuming (shorter period of hospitalization) and was associated with a lower mortality rate, whereas the prosthesis group had fewer reoperations and showed better results after one year of follow-up.

Table IV. — The treatment of displaced IFFN, Garden IV, in 1996. In 1988 displaced fractures, Garden III and IV, were counted as one group

		Orthopedic department	Department of general surgery
Garden IV fractures	Cannulated screws/hip pins — hemiarthro-/arthroplasty (graduated treatment)	23 (58%)	4 (20%)
	Sliding screw and plate — hemiarthro-/arthroplasty (graduated treatment)	4 (10%)	5 (25%)
	Cannulated screws/hip pins (all)	7 (17.5%)	2 (10%)
	Sliding screw and plate (all)	3 (7.5%)	0

As mentioned by Frandsen *et al.* in 1994 (1), staging of IFFN tends to distinguish two groups : Garden I and II (non displaced fractures) and Garden III and IV (displaced fractures). This is in accordance with the recent strategy of treatment, the "gold standard", which recommends cannulated screws/hip pins to all patients suffering a Garden I or II fracture independent of age, whereas a Garden I fracture previously was treated conservatively with mobilization without weight bearing (7, 8, 12, 24). In 15 to 30% of these fractures secondary displacement was seen, leading to a worse prognosis.

Garden I fractures as well as Garden II fractures must be treated with percutaneous cannulated screws/hip pins. A sliding screw and plate is usable with an additional screw, but because of the size of the sliding screw head, the invasion of the head is more important, and the risk of delayed healing and head necrosis is greater (5, 10, 11, 19, 25). Furthermore, the operation is more complicated and has a steeper "learning curve" (10, 18).

The treatment of the dislocated fractures, Garden III and IV, is followed by more complications (5, 10, 11, 19, 25) with delayed healing and head necrosis in up to 25 to 40% (5, 10, 11, 19, 25).

If the operation is performed with either cannulated screws/hip pins or a sliding screw and plate, reduction of the fracture and placement of the screw device is essential (5, 8, 10, 11, 17).

The meta-analysis of Lu - Yao *et al.* (25) of 106 papers dealing with IFFN and the "Current Concepts Review. Intracapsular Fractures of the Hip" of Swiontkowski (19), both from 1994, find after 6 months 16% failures in patients treated with internal fixation, whereas 2 to 3% with a hemiarthroplasty had a luxation. This is in line with the Danish investigation of Overgaard *et al.* (14) from 1991, where a reoperation rate of 4% was found following hemiarthroplasty.

Two years postsurgery Swiontkowski (19) found in the osteosynthesis group a reoperation rate of 35% and in the group of hemiarthroplasties a reoperation rate of 12 to 16% for either bi- or unipolar prostheses. The reoperation rate was 12% for patients who underwent total arthroplasty 3 to 6 years postsurgery.

When we compare this questionnaire survey to former Danish investigations (8, 10, 24) the influence of specialization is seen, leading to a change in the concept of treatment of these complex fractures with more prophylactic fixation of Garden I fractures. We see as well that the treatment of Garden II fractures follows current standards with a shift from sliding screw and plate to cannulated screws/hip pins (table II). This again is especially seen in departments of orthopedics.

The change with respect to the displaced fractures, Garden III and IV, is more difficult to evaluate, but the orthopedic departments are again closer to the contemporary standard (10, 19, 25), with more departments using graduated treatment with cannulated screws/hip pins in younger patients and hemiarthroplasty/arthroplasty in elderly patients (table III and IV).

It is concluded that a shift in the treatment of IFFN in Denmark has occurred, especially in departments of orthopedics. More specialized departments and specialists in orthopedics have brought about a change in the treatment, so that we now have come closer to the "gold standard".

In the spring of 1999, the Danish Orthopedic Society (DOS) agreed to a reference program in treating IFFN following the above-mentioned and the international recommendations, the "gold standard".

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SAMENVATTING

J. O. LAURSEN. Femurhalsfracturen in Denemarken : evolutie van de indicaties in de voorbije 10 jaren.

De auteur heeft aan de hand van een enquête de behandeling van femurhalsfracturen in 40 orthopedische diensten en 20 algemeen chirurgische diensten nagegaan. T.o.v. een gelijkaardig onderzoek in 1988 heeft hij een evolutie vastgesteld, vnl. bij de orthopedische diensten. De behandeling werd meer aangepast aan de individuele noden, rekening houdend met de leeftijd en de Garden classificatie. Garden I en II werden beschouwd als niet verplaatst en meestal behandeld met pinning of gecannuleerde schroeven. De verplaatste Garden III en IV werden bij patiënten jonger dan 75 jaar ook aldus behandeld; bij patiënten ouder dan 75 jaar werd meestal een hemiarthroplastie of een totale arthroplastie uitgevoerd.

De auteur besluit dat deze verandering in indicatie waarschijnlijk het gevolg is van een meer beschikbaarheid van orthopeden met ervaring in de heuparthroplastiek of door de bewustwording van de overmatige complicatieratio bij osteosynthese van verplaatste fracturen.

RÉSUMÉ

J. O. LAURSEN. Traitement des fractures du col fémoral au Danemark : évolution des indications au cours des dix dernières années.

L'auteur a réalisé au Danemark, une enquête sur le traitement chirurgical des fractures du col fémoral parmi 40 services d'orthopédie et 20 services de chirurgie générale. Le but était de rechercher si le traitement de ces fractures au Danemark était en accord avec les principes actuellement défendus dans la littérature internationale.

Il a noté une évolution du traitement, par rapport à une enquête réalisée en 1988. Les services d'orthopédie

réalisaient des traitements adaptés aux cas individuels, en tenant compte de l'âge des patients et du type de fracture selon la classification de Garden. L'indication variait selon que les fractures étaient ou non déplacées ; parmi les fractures déplacées, l'indication variait selon que les patients avaient plus ou moins de 75 ans. Les fractures Garden I et II (non déplacées) étaient le plus souvent fixées par des vis canulées ou des broches ; c'était aussi le cas des fractures Garden III ou IV (déplacées) chez les patients de moins de 75 ans. Au-delà de 75 ans, les fractures déplacées étaient le plus souvent traitées par héli-arthroplastie ou arthroplastie totale.

L'auteur conclut qu'il s'est produit un changement dans l'indication opératoire, surtout dans les services d'orthopédie. L'une des raisons est peut-être l'augmentation du nombre d'orthopédistes spécialisés ayant l'expérience de l'arthroplastie prothétique, ce qui permet de recourir davantage à des opérations de ce type. Une autre raison pourrait être le fait que les orthopédistes Danois ont pris conscience du caractère excessif des taux de complications après ostéosynthèse des fractures déplacées.