



Epidemiology and Diagnosis of Ipsilateral Femoral Neck and Shaft Fractures: A Systematic Review of 1761 cases in 1758 Patients (I.1990-VI.2015)

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Abstract

Objectives: Ipsilateral femoral neck and shaft fractures [IFNSF] are uncommon. The existing literature is characterized by a diversity of small reports with a lack of consensus. We performed a systematic review to examine the epidemiology and diagnosis of this injury.

Methods: Nineteen databases were used to find articles published between January 1990 and June 2015 with no language restriction. Inclusion criteria were studies describing a minimum of five patients 16 years old or older with acute IFNSF and adequate extractable data. Exclusion criteria were trochanteric fracture and malignancy at the time of retrieval. A series from the senior authors was also included.

Results: The selected 85 studies together with our series produced a total of 1758 patients with 1761 cases. The frequency of IFNSF in all femoral shaft fractures was 3.37%, mostly resulting from high energy trauma. The typical patient was a young adult male; the mean frequency of multiple injuries was 73.5 and ipsilateral knee injuries it was 27.3. Most neck fractures originated at the base of the neck, and the mean frequency of variable cranial exit point was 6 for sub capital, 35.5 for midcervical and 58.3 for basicervical. The mean proportion of vertical shear fractures was 60. The mean frequency of undisplaced neck fractures was 57.4. Shaft fractures were most often in the middle third -mean 74.4- and they were open in a mean of 18.3. The neck fracture was diagnosed postoperatively in a mean proportion of 8.7 of the cases. Diagnosis of the femoral neck fracture using only X-rays in the period 1990-2000 failed to demonstrate the fracture in 14% of the cases; a more careful scrutiny of the radiographs and other views improved diagnosis

leaving 7.88% of the cases without diagnosis in the period 2001-2015. The use of radiographs and CT scans and a protocol of radiographs, CT scans and intraoperative fluoroscopy reduced misdiagnosis to 4.94% and 6.34%, respectively.

Conclusions: This systematic review describes epidemiology of IFNSF, characterizes the usual pathoanatomy of the injuries and shows the influence of imaging protocols in improving diagnosis.

Keywords: Ipsilateral femoral neck and shaft fractures, Femoral neck fractures, Femoral shaft fractures, Segmental femoral fractures.

Introduction

Ipsilateral femoral neck and shaft fractures (IFNSF) are uncommon injuries, occurring in 0.8-9% of femoral shaft fractures [1-4], primarily found in young adults who are victims of high energy trauma, often with multiple associated injuries. The mechanism of injury is an axial force along the femoral axis with the hip in abduction [5-8]. This axial force, primarily applied on the knee, is mostly absorbed in the shaft, leading to a high frequency of undisplaced – and hence undiagnosed – femoral neck fractures [9,10]. Since the first report of this combined injury by Becher [11] IFNSF has been the subject of numerous publications. Most of these have been retrospective reports of small case series. Some were literature reviews [2,9,12-21], and a few were systematic reviews [3,4].

There are few and diverse estimates of the current incidence

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of ipsilateral neck fractures in the existing series of femoral shaft fractures, and there is a belief that this incidence may be increasing [9,19,22,23]. The anatomic patterns of the femoral neck fractures and the frequency of some epidemiologic factors are reported with considerable variation. Although new diagnostic tools are available, there remains a number of missed neck fractures in the combined injury, historically estimated at between 10 and 50% of the cases [2-4,8,17,20,24].

We have conducted a systematic review in order to provide current concise and consolidated dataset describing the epidemiology, pathoanatomy and diagnosis of IFNSF in patients 16 years-old or older. We sought to answer five key questions:

- 1) What is the frequency of ipsilateral femoral neck fractures relative to all femoral shaft fractures?
- 2) What common factors regarding age, sex, severity and type of trauma, and associated injuries can be identified?
- 3) What fracture patterns are represented and in what frequency?
- 4) What is the typical time to diagnosis of the femoral neck fracture relative to presentation?
- 5) What is the relative accuracy of the diagnostic methods reported?

Methods

This review was conducted in accordance to the PRISMA guidelines [25]. Data were documented according to a standardized protocol, where objectives and inclusion criteria were specified in detail.

Searches were conducted using the Cochrane Library, Dialnet, Embase, Google, J-Stage, KoreaMed, Lilacs, Medline, PubMed, OvidSP, Scielo, ScienceDirect, and Springer engines, and the AAOS, Indian Medical Journals, OTA, Science Links Japan, Turkish Academic Network and Information Center, and Wanfang Med Online web sites, using the keywords “ipsilateral femoral neck and shaft fractures” or “ipsilateral hip and femoral shaft fractures” or “hip and shaft fractures” or “femoral neck and shaft fractures” or “femoral neck-shaft fractures”. The senior authors (AB and JMG) selected potentially relevant abstracts and obtained full copies of the articles. Additionally all references of the retrieved articles were also reviewed for further potential references.

Criteria for eligibility

Studies selected were original clinical articles published between January 1990 and June 2015, that addressed IFNSH in patients 16-year old and older. Other inclusion criteria were a minimum of five patients in the study, and with acute IFNSF and adequate extractable data. Exclusion criteria were trochanteric fracture or malignancy at the time of retrieval. There was no language restriction.

Data extraction

Retrieved articles were translated if required and further information from authors was eventually requested. The studies were assessed by the senior authors for adequate methodology using a pro-forma, including level of evidence, patient numbers, and inclusion/exclusion criteria. The two reviewers agreed on the methods of assessment prior to reviewing the eligible studies. Duplicate publications were also excluded. Selected references were used to clarify the mechanism and classification of injuries, and diagnostic procedures. For the “present series” data was obtained from the records of the senior authors’ hospitals.

The assessment of the frequency of ipsilateral femoral neck fractures relative to all femoral shaft fractures included series of femoral shaft fractures which included cases of ipsilateral femoral neck fractures, with data extracted as type of study, time period of study, number of patients, and number of cases of IFNSF. The study of the other issues was based on detailed case reports of IFNSF or

cases with useful information –reported with a minimum of 5 cases, and data were extracted as type of study; age, sex, severity and type of trauma, and associated injuries; fracture patterns; time to diagnosis of the femoral neck fracture; and accuracy of diagnostic methods. The eventual effect of the date of publication on the distinct frequency of IFNSF and on the distinct incidence of missed diagnosis, in the periods 1990-2000 and 2001-2015, was also evaluated. The analysis of data was performed and recorded using Microsoft Excel (Microsoft Corp, Redwood, and Washington). Some authors provided relevant data differently or did not provide them in some instances. Therefore it was not always possible to calculate each parameter with data from all the studies. The number of pooled studies for each parameter was recorded.

Statistical analysis

As the majority of the data collected were from case reports and case series statistical analysis was not possible. Descriptive statistics were employed where possible (mean and standard deviation).

Results

The search study resulted in 234 references. After selection based on the title and the abstract 197 full text articles were examined, with 111 of these being excluded. Thus, 85 published studies [26-111] met the inclusion criteria; fifty-seven were written in English, nine in Korean, five in Spanish, four in Chinese, two in French, two in Italian, two in Portuguese, one in Czech, one in German, one in Thai and one in Turkish language. Although the cases published by Ostermann and Henry [43] had already been included in the article by Henry et al. and not used for the total sum of cases, they were separately analyzed for time to diagnosis as they showed an analysis on this item [27].

The sum of the cases retrieved from the literature and those from the senior authors’ hospitals was 1758 patients with 1761 concomitant fractures, including 3 bilateral cases.

Seventy-five studies were retrospective case series, three were comparative retrospective studies of case series, six were prospective case series, and one was a comparative non-randomized prospective study.

Frequency of IFNSF

The average frequency of ipsilateral femoral neck fractures in the total number of shaft fractures, in 16759 cases from 21 papers [32,37,40,41,45,50,54,59,60,65,68,71,77,82,88,89,90,92,94,95,99], was very low -3.37%.

Age, sex, type of injury, associated injuries, and ipsilateral knee injuries (Table 1). The mean age of the patients at the time of injury in 60 studies was 36.5 years and the mean proportion of males in 63 studies was 78.9%. The severity of trauma was informed in 58 series: the mean frequency of cases resulting from high energy was 99.2, leaving a mean of 0.8 for low energy traumatic cases. The type of trauma was noted in 47 studies: the mean frequency of traffic accidents was 87.1, of falls from a height 12.3, and from a simple fall from the same height it was 0.5. The mean frequency of associated injuries (skeletal and/or visceral) in 44 studies was 73.5, and for associated knee injuries the mean was 27.3 in 34 studies.

Fracture patterns (Table 2). Most neck fractures with information on their topography originated at or near the base of the femoral neck, and the cranial exit point was variable, either being subcapital, midcervical or basicervical. The mean incidence of subcapital fractures was 6.0, of midcervical fractures 35.5, and of basicervical fractures it was 58.3. The vertical inclination of femoral neck fractures was noted if they were classified as such by the author, in cases of Pauwels’ type 3 inclination [112], or if they belonged to the AO-OTA subgroup B2.3 pattern [113]. The mean incidence of these vertical neck fractures in 16 series was 60.0. Neck fractures were also classified in undisplaced, which included Garden types I and II, and displaced in cases of Garden types III and IV [114]. The mean frequency of displaced neck fractures was 42.6; of the displaced fractures, the mean proportion of displaced fractures in subcapital fractures was 48.3,

Table 1: Demographic and Trauma Related Data (n = 65).

Variable	Number Studies (References)	Results Mean (SD)
Number of cases	65 [26,27,29-40,42,44-48,50-58,61,63-65,67-69,71-73,76-78,80,81,83-87,89-92,94,96-98,100-102,106,109-111] and the present series	17.8 (10.8)
Age	60 [26,27,29-38,40,42,44,45,48,50-55,57,58,61,63-65,67-69,71-73,76-8,80,81,83-92,94,96-98,100-102,109-111] and the present series	36.5 (27.4)
Sex	63 [26,27,29-40,42,44,45,48,49,51-58,61,63-65,67,69,71-73,76-78,80,81,83-87,89-92,94,96-98,100,102,106,109-111] and the present series	78.9 % Males
Severity of trauma	58 [26,27,29-40,42,45,46,48,50-55,57,58,61,63-65,67-69,71-73,76-78,80,81,83-86,89-92,94,96-98,101,102,109-111] and the present series	High energy: 99.2 (3.6) Low energy: 0.8 (3.6)
Type of trauma	47 [26,27,29-32,34,36-38,40,42,45,46,48,50,51,53-55,57,58,61,63,65,67,71-73,76,78,81,83-85,89-92,94,96,98,101,102,109,110] and the present series	Traffic accident: 87.1 (14.5) Fall from height: 12.3 (14.7) Fall: 0.5 (3.2)
Associated injuries	44 [26,29-38,40,42,44,45,48,53-55,63,65,67,68,72,73,76,78,81,84-86,90-92,94,96,98,100-102,106,109,110] and the present series	73.5 (21.7)
Associated knee injuries	34 [26,29,31,35,36-38,40,44,45,47,48,53-56,65,68,72,73,78,81,85,86,90,92,94,98,100-102,109,110] and the present series	27.3 (21.0)

Table 2: Fractures patterns data (n = 73)

Variable	Number Studies (References)	Results Mean (SD)
Site of Neck Fracture	50 [26,28-32,34,35,39,40,42,44-49,52-55,57,61,63,65-70,72-74,76-81,83-85,90,92,98,102-104,108] and the present series	Subcapital: 6.0 (13.9) Midcervical: 35.5 (22.1) Basicervical: 58.3 (23.1)
Vertical Neck Fractures	16 [31,34,38,48,49,55,57,63,65,74,90,92,97,108,109] and the present series	60.0 (26.1)
Displaced Neck Fractures	55 [26,31-40,45,47,48,51-53,57,58,61-69,72,73,75-77,79-81,84-91,94,96-101,109,110] and the present series	42.6 (24.9)
Displacement by Site Neck Fracture	23 [26,31,32,34,35,38,39,45,51,52,54,57,63,65-67,72,73,77,81,85,98] and the present series	Subcapital: 48.3 (44.9) Midcervical: 66.2 (35.7) Basicervical: 43.2 (36.4)
Site of Shaft Fracture	42 [26,27,29-32,34-36,38,40,42,44,45,47,52-,55,57,58,61,63-66,68,72,73,76,77,79,84-86,89,90,92,98,100,109] and the present series	Proximal: 8.5 (9.7) Middle: 74.4 (18.7) Distal: 16.2 (17.9) Segmental: 0.9 (2.4)
Unstable Femoral Shaft Fractures (AO type B or C; Winquist II, III or IV, segmental and spiral)	44 [26,32-35,37,38,40,47,51,54,55,57,58,61,63,65-68,72,73,76,77,79-81,83-85,87,90-92,94,96,98,100,102,109-111] and the present series	69.3 (23.4)
Open Femoral Shaft Fractures	46 [26,27,29,32-36,40,44,45,47-49,53-56,58,61,63,65-69,72,73,76,77,79,80,83-85,87,90-92,94,96,98,100,109,110] and the present series	18.3 (16.2)
Grades of Open Femoral Shaft Fractures (Gustilo)	26 [32,34,40,45,49,54,58,61,63,65-68,73,79,80,83,90-92,94,96,98,100,109,110] and the present series	Gustilo 1: 36.7 (36.1) Gustilo 2: 57.4 (36.2) Gustilo 3: 5.9 (12.4)

in midcervical fractures it was 66.2, and in the group of basicervical fractures it was 43.2. The femoral shaft fractures were classified according to their location in four types, i.e. proximal third; middle third, distal third, and segmental fractures. The mean incidence of these types was 8.5, 74.4, 16.2 and 0.9, respectively. They were divided into stable and unstable. The mean incidence of unstable fractures i.e. those reported as Winquist II, III and IV [115], segmental and spiral, and those reported as AO groups B and C [113], was 69.3. The mean incidence of open shaft fractures was 18.3. When classified according to the criteria of Gustilo and Anderson [116] the mean frequency of grade I was 36.7, grade II 57.4, and grade III 5.9.

Time of diagnosis of the femoral neck fracture (Table 3). Pre-operative and intra-operative diagnosis was considered a timely diagnosis. Cases with missed diagnosis were those with post-operative diagnosis of the neck fracture. The mean rate of missed diagnosis of the neck fracture was 8.7, and the mean proportion of undisplaced neck fractures among these postoperatively diagnosed cases was 78.8.

Accuracy of diagnostic methods for the femoral neck fracture (Table 4). The accuracy of diagnostic methods for the femoral neck fracture was studied with an analysis of the time of diagnosis of the neck fracture in three different groups according to the imagenologic methods used: a) only X-rays; b) X-rays and CT scans; and c) X-rays,

CT scans and intra-operative fluoroscopy. In addition the first group was also analyzed in two periods, i.e. 1990-2000 and 2001-2015. We found in the group of only X-rays a frequency of missed diagnosis averaging 9.88%, and when this group was divided in the two periods, the frequency was 14.02% in the series published in the period 1990-2000 and 7.88% in between 2001 and 2015. When the diagnostic methods used were X-rays plus CT scans the frequency of missed neck fractures was 4.94%, and in the group of X-rays, CT scans and fluoroscopy it was 6.34%. There was a further series of 28 cases in which X-rays and aspiration of the hip provided diagnosis in every case.

Discussion

The frequency of IFNSF continues to be low -3.37%. Several authors have considered a rise of this combination of injuries, because of an increase in high-velocity trauma, a shift toward smaller motor vehicles with dashboards located at the knee level resulting in a directional force necessary to produce this combined fracture, improved resuscitation capabilities leading to improved survival in these patients, and better recognition of the combined injury [9,19,68,70,75]. However, we could not ascertain this rise, when comparing our findings with those of Alho of the 20th century [3,4].

Table 3: Time of diagnosis of IFNSF.

(n = 76) [26,28,30-45,47,48,51-54,57-59,61,62,64-94,96-102,104,106,107,109,110] and the present series	
Variable	Results Mean (SD)
Preoperative diagnosis of femoral neck fracture	87.0 (14.4)
Intraoperative diagnosis of femoral neck fracture	4.4 (7.0)
Postoperative diagnosis of femoral neck fracture	8.7 (12.2)

Table 4: Method of diagnosis versus time of diagnosis of femoral neck fracture in IFNSF.

Method of diagnosis	Nº of series (References)	Nº of cases	Preoperative	Intraoperative	Postoperative
X-rays only	78 [26,28,30-45,47,48,51-54,57-59,61,62,64,66-68,70,72-86,89-91,93,94, 96,98,100-102,104,106,107,109] and the present series	1163	86.41%	4.55%	9.88%
X-rays - CT	4 [65,69,92,97]	81	90.12%	4.94%	4.94%
X-rays – CT - fluoroscopy	4 [71,82,93,99]	79	88.60%	5.06%	6.34%

The typical patient is a young adult male. The age range, however, goes between 16 and 90 years, confirming that any patient involved in high-energy trauma may suffer the combined injury [19]. Although mild or moderate injuries may also produce it, this only occurred in less than 1% of the cases in this review and referred exclusively to older patients, with fragile bones. Most commonly, the combined injury occurs in polytraumatized patients, with elevated Injury Severity Score [3,13,98], usually produced by traffic accidents and, much less frequently, by falls from a height. Knee injuries are the most commonly associated musculoskeletal injuries, dependent on the axial force mechanism of IFNSF.

The incidence of subcapital, midcervical and basal fractures was similar to that found by Alho in his systematic reviews published in 1996 and 1997 [3,4], the fracture being more frequently basal. Most neck fractures were clustered at or near the base of the neck, a fracture type that has been reported by few authors [48,49,51,117], differing from the spiral type commonly seen in isolated femoral neck fractures [10,23,49,118]. This shear fracture of the femoral neck is a unique pattern related to the mechanism of production of this combined injury [3,16,20,119], and its mean frequency in the review series was 60.

Although the shaft fracture may occur in any of its portions, middle third shaft fractures were the most frequent; The mean incidence of unstable shaft fractures was 69.3, and they were open in a mean of 18.3. These findings reflect the high energy absorbed by the shaft in the combined injury [2,3,7,8,14,32,35,48,54,58,120].

Previous authors have found a substantial number of femoral neck fractures ipsilateral to femoral shaft fractures that remain occult after plain radiographic examination. The femoral neck fracture in this condition is missed for several reasons [2,3,4,9,14,17,19,20,35,3,9,41,89,97,109,121]: 1) there is diversion by treatment of associated life-threatening injuries; 2) focus is on the more obvious femoral shaft fracture and frequent knee injuries; 3) patients who are head injured or obtunded cannot report hip pain, and those who are awake may have their pain masked by the pain of the shaft fracture; 4) 57.4% of the neck fractures are undisplaced or minimally displaced; 5) no routine in taking primary and high quality radiographs of the entire femur with the hip and knee in both frontal and lateral views; and 6) because of superimposition, the greater trochanter obscures the femoral neck in the anteroposterior (ap) radiograph of the hip. The complete diagnosis of the neck-shaft fractures before fixation is important for several reasons: 1) hip fractures in young people are known medical urgencies [122]; 2) better preoperative planning and fixation is thus possible [122], as the previous treatment of the femoral shaft fracture may lead to difficulties in the subsequent management of the overlooked fracture of the femoral neck [36,54,123]; 3) a femoral neck fracture or displacement of a previously nondisplaced neck fracture may occur as a result of intramedullary nail fixation of a femoral shaft fracture [124-126], leading to patient complications [8] and medico-

legal problems; and 4) because it prevents the discomfort, risks, and costs of a second surgery [7,121]. Furthermore, the diagnostic steps are not complete until a careful clinical and imangenologic exam of the ipsilateral knee is complete.

Reducing the frequency of missed diagnosis is dependent upon maintaining a high index of suspicion: all femoral shaft fractures resulting from a high-energy mechanism should be suspected for ipsilateral neck fracture [17,18,75,127]. This attitude and the use of supplementary radiographic views of the hip have led to a reduction of the incidence of diagnostic failure only using radiographs from 14.% in the period 1990-2000 to 7.88 in the period 2001-2015. A cross-table or an obturator oblique view of the hip [128] or an anteroposterior radiograph of the pelvis with placement of a triangular radiolucent block under the buttock of the injured side to produce internal rotation of the hip [92] might facilitate more frequent diagnosis of the femoral neck fracture in the combined injury.

The use of thin cut computed tomography (CT) scans has been advocated as a tool to improve diagnosis of these occult fractures [7,24,35,54,60,69,78,96,97,111,121,127,129-132]. However, femoral neck fractures in IFNSF may be missed even with the use of thin-cut CT scans in these polytraumatized patients [8,20,88,71,24,105]. The group of Dietz and O'Toole in 2008 and 2013 found that CT scans were sensitive but still missed some femoral neck fractures, and suggested that both diagnostic methods should be combined to improve diagnosis [24,105]. The present study also showed that the use of high quality scans with appropriate reconstruction, supplementing high quality radiographs, diminished the incidence of missed femoral neck fractures to a mean 4.94%.

The use of perioperative fluoroscopy, with multiple views using the image intensifier, under anaesthesia, before, during and after fixation of the femoral shaft fracture, as reported by Tornetta et al. [82], and Xue et al. [93], contributes to improved detection of a timely diagnosis of the femoral neck fracture associated with an ipsilateral shaft fracture, when compared with historical reviews, though misdiagnosis is still found with this procedure [7,8,20,88,99]. The analysis of series using radiographs, CT scans and intraoperative fluoroscopy in the present review led to an average of 6.34% of missed neck fractures, a similar finding that those reported separately by Tornetta et al. [82] and Xue et al. [93].

These "clandestine" femoral neck fractures [41] should be suspected whenever there is persistent hip pain or disability after treatment of a femoral shaft fracture, and further clinical and imangenologic evaluation of the hip should be performed [17,41,71].

It is interesting to note that Gavaskar and Tummala have recently described a further method of diagnosis, using frontal radiographs of the ipsilateral hip in femoral shaft fractures and aspiration of the hip to rule out an associated neck fracture, providing diagnosis of the femoral neck fracture in every case [95].

There are certain limitations to the current meta-analysis inherent to the nature of the available data. Most of the analyzed series are retrospective in nature. Small sample sizes, which are typical for studies of this topic, are subject to systematic and random biases. Although we set the minimum number of included patients for eligible studies to be 5, this is a subjectively determined threshold that does not necessarily diminish the deleterious effects of small sample sizes. However, the large number of studies and patients reviewed and the selection of studies with no limitation of language, provide support to the overall results.

In summary, the current study describes the epidemiology and patho-anatomic findings of IFNSF. It supports the use of careful preoperative screening for femoral neck fracture with high quality and appropriately oriented radiographs and CT scans, supplemented by a dedicated intraoperative fluoroscopic imaging of the femoral neck in every patient with a femoral shaft fracture after severe trauma. Randomized studies are not feasible based on the volume and prevalence of this particular combination of injuries. Consequently, meta-analyses such as the present one provide the best evidence available.

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References

- Dencker H (1965) femoral shaft fracture and fracture of the neck of the same femur. *Acta Chir Scand* 129: 597-605.
- Wolinsky PR, Johnson KD (1995) Ipsilateral femoral neck and shaft fractures. *Clin Orthop Relat Res*: 81-90.
- Alho A (1996) Concurrent ipsilateral fractures of the hip and femoral shaft: a meta-analysis of 659 cases. *Acta Orthop Scand* 67: 19-28.
- Alho A (1997) Concurrent ipsilateral fractures of the hip and shaft of the femur. A systematic review of 722 cases. *Ann Chir Gynaecol* 86: 326-336.
- Ritchey SJ, Schonholtz GJ, Thompson MS (1958) The dashboard femoral fracture: pathomechanics, treatment, and prevention. *J Bone Joint Surg Am* 40-40A: 1347-58.
- Alho A (1980) Injuries in the femoral axis. *Int Orthop* 3: 271-279.
- Higgins GA, Kuzyk PR, Schemitsch EH (2011) Combined fractures of the hip and femoral shaft. In: Waddell JP *Fractures of the proximal femur. Improving Outcome*. Philadelphia, PA 81-84.
- Boulton CL, Pollak AN (2015) Special topic: Ipsilateral femoral neck and shaft fractures—does evidence give us the answer? *Injury* 46: 478-483.
- Plancher KD, Donskik JD (1997) Femoral neck and ipsilateral neck and shaft fractures in the young adult. *Orthop Clin North Am* 28: 447-459.
- Alho A (2002) Bifocal femoral fractures. In: Robinson CM, Alho A, Court-Brown CM *Musculoskeletal Trauma Series*. London 144-156.
- Becher H (1951) Nailing of femur neck fracture nailing of femur neck fracture with a concomitant fracture of femur head. *Zentralbl Chir* 76: 1609-1612.
- Bernstein SM (1974) Fractures of the femoral shaft and associated ipsilateral fractures of the hip. *Orthop Clin North Am* 5: 799-818.
- Casey MJ, Chapman MW (1979) Ipsilateral concomitant fractures of the hip and femoral shaft. *J Bone Joint Surg Am* 61: 503-509.
- Bucholz RW, Rathjen K (1985) Concomitant ipsilateral fractures of the hip and femur treated with interlocking nails. *Orthopedics* 8: 1402-1406.
- Friedman RJ, Wyman ET Jr (1986) Ipsilateral hip and femoral shaft fractures. *Clin Orthop Relat Res*: 188-194.
- Hume EL, Catalano JB (1994) Ipsilateral femoral neck and shaft fractures of the femurs. *Techniques in Orthopaedics* 4:111-115.
- Peljovich AE, Patterson BM (1998) Ipsilateral femoral neck and shaft fractures. *J Am Acad Orthop Surg* 6: 106-113.
- Russell TA (1998) Ipsilateral femoral neck and shaft fractures: what have we learned? *Techniques in Orthopaedics* 13: 100-108.
- Egol KA, Koval KJ (1999) Treatment of ipsilateral femoral neck and shaft fractures. *Medscape General Medicine*, 1.
- Hak DJ, Mauffrey C, Hake M, Hammerberg EM, Stahel PF (2015) Ipsilateral femoral neck and shaft fractures: current diagnostic and treatment strategies. *Orthopedics* 38: 247-251.
- Kuzyk PR, Schemitsch EH (2009) Combined fractures of the hip and femoral shaft: what is the best treatment method? In: Wright JG *Evidence-Based Orthopaedics*. Saunder Elsevier, Philadelphia, PA, 387-391.
- Watson JT, Moed BR (2002) Ipsilateral femoral neck and shaft fractures: complications and their treatment. *Clin Orthop Relat Res*: 78-86.
- Lambiris E, Giannikas D, Galanopoulos G (2003). A new classification and treatment protocol for combined fractures of the femoral shaft with the proximal or distal femur with closed locked intramedullary nailing: clinical experience of 63 fractures. *Orthopedics* 26: 305-308.
- Dietz AR, O'Toole RV, Pollak AN (2008) Are CT scans better than plain films for diagnosing femoral neck fractures associated with femoral shaft fractures? *24th Annual Meeting of the Orthopaedic Trauma Association*.
- Moher D, Liberati A, Tetzlaff J, Altman D (2009) Preferred reporting items for systematic reviews and meta-analyses: the PRISMA statement. *BMJ* 339: b2535.
- Gill SS, Nagi ON, Dhillon MS (1990) Ipsilateral fractures of femoral neck and shaft. *J Orthop Trauma* 4: 293-298.
- Henry SL, Seligson D, Janssen E (1990) Ipsilateral femoral shaft fractures. Management with the reconstruction nail. *South Med J* 83: 2S-49.
- Ruiz A, Ramos J, Redo J (1990) Tratamiento de las fracturas ipsilaterales de cadera y diáfisis femoral. *Avances Traumatol* 20: 117-121.
- Scarpone R, Cornelli F, Fiore A (1990) Sulle fratture bifocali di femore, omolaterali. *Casistica. Min Ortop Traumatol* 41: 563-565.
- Kwun KW, Kim SK, Lee SW (1991) Treatment of ipsilateral hip and femoral shaft fractures – Report of 6 cases. *J Korean Orthop Assoc* 26: 1925-1930.
- Park MS, Kim KH (1991) Ipsilateral femoral neck and shaft fracture. *J Korean Orthop Asoc* 26: 1434-1440.
- Wu CC, Shih CH (1991) Ipsilateral femoral neck and shaft fractures. Retrospective study of 33 cases. *Acta Orthop Scand* 62: 346-351.
- Bose WJ, Corces A, Anderson LD (1992) A preliminary experience with the Russell-Taylor reconstruction nail for complex femoral fractures. *J Trauma* 32: 71-76.
- Wiss DA, Sima W, Brien WW (1992) Ipsilateral fractures of the femoral neck and shaft. *J Orthop Trauma* 6: 159-166.
- Bennett FS, Zinar DM, Kilgus DJ (1993) Ipsilateral hip and femoral shaft fractures. *Clin Orthop Relat Res*: 168-177.
- Chaturvedi S, Sahu SC (1993) Ipsilateral concomitant fractures of the femoral neck and shaft. *Injury* 24: 243-246.
- Largab A, Ouarab M, Cohen D (1993) Les fractures associées homolatérales du col et de la diaphyse fémorale. A propos de 22 cas. *Rev maroc chir orthop traumato* 4: 31-33.
- Lee SH, Ha SH (1993) Ipsilateral fracture of the femoral neck and shaft. *J Korean Orthop Assoc* 28: 705-712.
- Leung KS, So WS, Lam TP, Leung PC (1993) Treatment of ipsilateral femoral shaft fractures and hip fractures. *Injury* 24: 41-45.
- Parfenchuk TA, Carter LW, Young TR (1993) Ipsilateral fractures of the femoral neck and shaft. *Orthop Rev* 22: 356-363.
- Riemer BL, Butterfield SL, Ray RL, Daffner RH (1993) Clandestine femoral neck fractures with ipsilateral diaphyseal fractures. *J Orthop Trauma* 7: 443-449.
- Canto RS, Neto PR, Oliveira OB (1994) Fratura ipsilateral do quadril e da diáfise femoral: estudo prospectivo. *Rev Bras Ortop* 29: 379-384.
- Ostermann PA, Henry SL (1994) Treatment of the ipsilateral femur shaft and femur neck fractures with the Russell-Taylor reconstruction nail. *Chirurg* 65: 1042-1045.
- Azar FM, Russell TA (1995) Ipsilateral femoral neck and shaft fractures: a prospective study using a reconstruction nail. *Orthop Trans* 19:242.
- García D, Sesma PJ, Fernández L (1995) Fracturas de cadera y diáfisis ipsilaterales. *Rev Esp Cir Osteoart* 30: 151-155.
- Riquelme G, Vicente E, Fernández JR (1995) Asociación de la fractura de diáfisis femoral y fractura de cadera ipsilateral. *Rev Ortop Traumatol* 39: 125-129.
- Suh, KT, Cheon SJ, Yoo C (1996) Concomitant ipsilateral femoral neck and shaft fractures. *J Korean Fract Soc* 9: 458-465.
- Koldenhoven GA, Burke JS, Pierron R (1997) Ipsilateral femoral neck and shaft fractures. *South Med J* 90: 288-293.
- Shuler TE, Gruen GS, DiTano O, Riemer BL (1997) Ipsilateral proximal and shaft femoral fractures: spectrum of injury involving the femoral neck. *Injury* 28: 293-297.
- Yang CK, Chih CJ, Su CC, Wei KY (1997) Management of ipsilateral femoral shaft and neck fracture. *Kaohsiung J Med Sci* 13: 704-709.

51. Zuppi GN, Tenord RB, Koberle G (1997) Tratamento das fraturas do quadril e da diáfise do fêmur homolaterais. *Rev Bras Ortop* 32: 443-447.

52. Kim CK, Kim JH, Kim DY (1998) Ipsilateral fracture of the femoral neck and shaft. *J Korean Fract Soc* 11: 738-744.

53. Kim BH, Sohn SK, Park SJ (1999) Ipsilateral fractures of femoral neck and shaft. *J Korean Fract Soc* 12: 13-20.

54. Laporte C, Benazet JP, Scemama P, Castelain C, Saillant G (1999) [Ipsilateral hip and femoral shaft fractures: components of therapeutic choice]. *Rev Chir Orthop Reparatrice Appar Mot* 85: 24-32.

55. Lee DC, Lee YS, Shin D (1999) Ipsilateral femoral shaft and neck fracture. *J Korean Fract Soc* 12: 245-252.

56. Lin DY, Huang PC (1999) Ipsilateral hip and femoral shaft fractures – treatment with reverse interlocking nail and knowles pin. *J Orthop Surg Taiwan* 16: 219-226.

57. Ostrum RF, Poka A (1999) Ipsilateral femoral hip and shaft fractures: a management protocol. *Am J Orthop* 28: 4-11.

58. Randelli P, Landi S, Fanton F, Hoover GK, Morandi M (1999) Treatment of ipsilateral femoral neck and shaft fractures with the Russell-Taylor reconstructive nail. *Orthopedics* 22: 673-676.

59. Hernández RD, Echeverri AA (2000) Fracturas del cuello femoral no diagnosticadas en casos ipsilaterales con la diáfisis. *Rev Colombiana Ortop Traumatol* 14: 177-182.

60. Morris CD, Whittle AP, Henley N (2000) Ability of computed tomography to detect occult ipsilateral femoral neck fractures associated with high-energy femoral shaft fractures. 24th Annual Meeting of the Orthopaedic Trauma Association. San Antonio, TX.

61. Hossam ElShafie M, Adel Morsey H, Emad Eid Y (2001) Ipsilateral fracture of the femoral neck and shaft, treatment by reconstruction interlocking nail. *Arch Orthop Trauma Surg* 121: 71-74.

62. Agarwal A, Gupta SP (2002) Ipsilateral hip and femoral shaft fractures. *Indian J Orthop* 36.

63. Lin SH, Lo CW, Cheng SC, Kuo MY, Chin LS (2002) Use of reconstruction nails to manage ipsilateral displaced femoral neck-shaft fractures: assessment of a new approach. *J Orthop Surg (Hong Kong)* 10: 185-193.

64. Lektrakul S (2003) Ipsilateral fractures of the femoral necks and shafts: long term follow up. *Med J Ubon Hosp J* 24: 70-75.

65. Okcu G, Aktuglu K (2003) Antegrade nailing of femoral shaft fractures combined with neck or distal femur fractures. A retrospective review of 25 cases, with a follow-up of 36-150 months. *Arch Orthop Trauma Surg* 123: 544-550.

66. Dağlar B, Bayrakçı K, Taşbaş BA, Deveci A, Günel U (2004) A comparison of different fixation combinations for the treatment of ipsilateral hip and femoral diaphyseal fractures. *Ulus Travma Acil Cerrahi Derg* 10: 123-127.

67. Hung SH, Hsu CY, Hsu SF, Huang PJ, Cheng YM, et al. (2004) Surgical treatment for ipsilateral fractures of the hip and femoral shaft. *Injury* 35: 165-169.

68. Jain P, Maini L, Mishra P, Upadhyay A, Agarwal A (2004) Cephalomedullary interlocked nail for ipsilateral hip and femoral shaft fractures. *Injury* 35: 1031-1038.

69. Wu LD, Wu QH, Yan SG, Pan ZJ (2004) Treatment of ipsilateral hip and femoral shaft fractures with reconstructive intramedullary interlocking nail. *Chin J Traumatol* 7: 7-12.

70. Babhulkar S, Babhulkar S (2005) Gamma nail in treatment of ipsilateral fracture of shaft and neck of the femur. *Indian J Orthop* 39: 104-107.

71. Gibson WK, Hubbard J (2005) Delayed presentation of ipsilateral femoral neck fractures in diaphyseal femur fractures. *J Surg Orthop Adv* 14: 77-81.

72. Kakkar R, Kumar S, Singh AK (2005) Cephalomedullary nailing for proximal femoral fractures. *Int Orthop* 29: 21-24.

73. Khalaf F, Al-Mosalamy M, Al-Akkad M, Hantira H (2005) Surgical treatment for ipsilateral fractures of femoral neck and shaft. *Med Princ Pract* 14: 318-324.

74. Del Sasso L, Zottola V, Romano F (2006) Le fratture ipsilaterali delle diafisi e del femore prossimale. *G.I.O.T.* 32: S277-80.

75. Garg R, Bassi JL, Yamin M (2006) Analysis of the results of ipsilateral hip and shaft femur fractures treated with reconstruction nail. *Indian J Orthop* 40: 238-242.

76. Oh CW, Oh JK, Park BC, Jeon IH, Kyung HS, et al. (2006) Retrograde nailing with subsequent screw fixation for ipsilateral femoral shaft and neck fractures. *Arch Orthop Trauma Surg* 126: 448-453.

77. Gómez P, Rodríguez EC (2007) Tratamiento de las secuelas de las lesiones ocultas en las fracturas de fémur. *Patología Aparato Locomotor* 5: 33-40.

78. Ni HW, Li ZW, Zhou W (2007) Diagnosis and treatment for ipsilateral fractures of femoral neck and shaft. *Orthop J China* 15: 724-726.

79. Oh CW, Oh JK, Min WK, Kim SY, Baek SH, et al. (2007) Comparison of operative methods between retrograde and antegrade nailing for ipsilateral femoral shaft and neck fracture. *J Korean Fract Soc* 20: 135-140.

80. Pavelka T, Houcek P, Linhart M, Matejka J (2007) [Osteosynthesis of hip and femoral shaft fractures using the PFN-long]. *Acta Chir Orthop Traumatol Cech* 74: 91-98.

81. Shetty MS, Kumar MA, Ireshanavar SS, Sudhakar D (2007) Ipsilateral hip and femoral shaft fractures treated with intramedullary nails. *Int Orthop* 31: 77-81.

82. Tornetta P 3rd, Kain MS, Creevy WR (2007) Diagnosis of femoral neck fractures in patients with a femoral shaft fracture. Improvement with a standard protocol. *J Bone Joint Surg Am* 89: 39-43.

83. Abalo A, Dossim A, Ouro Bangna AF, Tomta K, Assiobio A, et al. (2008) Dynamic hip screw and compression plate fixation of ipsilateral femoral neck and shaft fractures. *J Orthop Surg (Hong Kong)* 16: 35-38.

84. Singh R, Rohilla R, Magu NK, Siwach R, Kadian V, et al. (2008) Ipsilateral femoral neck and shaft fractures: a retrospective analysis of two treatment methods. *J Orthop Traumatol* 9: 141-147.

85. Tzachev N, Baltov A, Ivanov V (2008) Cefalomedullary nails in the treatment of ipsilateral femoral neck and shaft fractures.

86. Wang HQ, Han YS, Li XK, Li MQ, Wei YY, et al. (2008) Treatment of ipsilateral femoral neck and shaft fractures. *Chin J Traumatol* 11: 171-174.

87. Bedi A, Karunakar MA, Caron T, Sanders RW, Haidukewych GJ (2009) Accuracy of reduction of ipsilateral femoral neck and shaft fractures—an analysis of various internal fixation strategies. *J Orthop Trauma* 23: 249-253.

88. Cannada LK, Viehe T, Cates CA, Norris RJ, Zura RD, et al. (2009) A retrospective review of high-energy femoral neck-shaft fractures. *J Orthop Trauma* 23: 254-260.

89. Park HG, Kim MH, Yoo MJ. Fracture of the femoral shaft with ipsilateral fracture of the femoral neck.

90. Tsai CH, Hsu HC, Fong YC, Lin CJ, Chen YH, et al. (2009) Treatment for ipsilateral fractures of femoral neck and shaft. *Injury* 40: 778-782.

91. Tsai MC, Wu CC, Hsiao CW, Huang JW, Kao HK, et al. (2009) Reconstruction intramedullary nailing for ipsilateral femoral neck and shaft fractures: main factors determining prognosis. *Chang Gung Med J* 32: 563-573.

92. Vidyadhara S, Rao SK (2009) Cephalomedullary nails in the management of ipsilateral neck and shaft fractures of the femur—one or two femoral neck screws? *Injury* 40: 296-303.

93. Xue W, Liu L, Guan KL (2009) A diagnostic protocol for ipsilateral femoral neck and shaft fractures. *Chinese J Orthop Trauma* 11: 501-503.

94. Astur Neto N, Lins RA, Kojima K, da Cunha BL, J Soares, et al. (2010) Outcomes in treatment of diaphyseal femur fractures ipsilateral to the neck or transtrochanteric fracture. *Acta Orthop Bras* 18: 255-260.

95. Gavaskar A, Tummala N (2010) Ipsilateral neck and shaft fractures of femur: results of cephalomedullary nailing following an improved protocol for diagnosis. *J Bone Joint Surg Br* 92-B: 548.

96. Wang WY, Liu L, Wang GL, Fang Y, Yang TF (2010) Ipsilateral basicervical femoral neck and shaft fractures treated with long proximal femoral nail antirotation or various plate combinations: comparative study. *J Orthop Sci* 15: 323-330.

97. Gary JL, Taksali S, Reinert CM, Starr AJ (2011) Ipsilateral femoral shaft and neck fractures: are cephalomedullary nails appropriate? *J Surg Orthop Adv* 20: 122-125.

98. Tsarouhas A, Hantes ME, Karachalios T, Bargiotas K, Malizos KN (2011) Reconstruction nailing for ipsilateral femoral neck and shaft fractures. *Strategies Trauma Limb Reconstr* 6: 69-75.

99. Amsdell SL, Humphrey CA, Gross MJ, Ketz JP, Gorczyca JT, et al. (2012) Diagnosis of femoral neck fractures with femoral shaft fractures: do we need intraoperative radiographs? *Orthopaedic Trauma Association 28th Annual Meeting*. Minneapolis, MS.

100. Habib ME, Hannout YS, Shams AF (2012) Treatment of ipsilateral femoral neck and shaft fractures. *Life Science J* 9: 813-817.

101. Javaid Z, Rehman OU, Uddin I, Syed Furqan (2012) Treatment evaluation of concomitant femoral neck and shaft fractures. *J Rawalpindi Med Coll (JRMC)* 16: 28-30.

102. Kesemenli CC, Tosun B, Kim NS (2012) A comparison of intramedullary nailing and plate-screw fixation in the treatment for ipsilateral fracture of the hip and femoral shaft. *Musculoskeletal Surg* 96: 117-124.

103. Bali K, Gahlot N, Aggarwal S, Goni V (2013) Cephalomedullary fixation for femoral neck/intertrochanteric and ipsilateral shaft fractures: surgical tips and pitfalls. *Chin J Traumatol* 16: 40-45.

104. Gadegone W, Lokhande V, Salphale Y, Ramteke A (2013) Long proximal

femoral nail in ipsilateral fractures proximal femur and shaft of femur. Indian J Orthop 47: 272-277.

105. O'Toole RV, Dancy L, Dietz AR, Pollak AN, Johnson AJ, et al. (2013) Diagnosis of femoral neck fracture associated with femoral shaft fracture: blinded comparison of computed tomography and plain radiography. J Orthop Trauma 27: 325-330.

106. Singh A (2013) Management of ipsilateral fracture of neck and shaft of femur with reconstruction nail. J Evolution Medical Dental Sc 2: 6341-6346.

107. Desai Y, Gupta R, Patel RA (2014) Study of results of ipsilateral fracture neck and shaft femur operated by proximal femoral interlocking nail. Indian J Applied Res (Orthopaedics) 4: 48-50.

108. Ostrum RF, Tornetta P 3rd, Watson JT, Christiano A, Vafei E (2014) Ipsilateral proximal femur and shaft fractures treated with hip screws and a reamed retrograde intramedullary nail. Clin Orthop Relat Res 472: 2751-2758.

109. Salama FH, Abdel-Kader MH, Mohamed OA (2014) Ipsilateral femoral neck and shaft fractures: treatment with a reconstructive interlocking nail. Egyptian Orthop J 49:183-187.

110. Lee SJ, Lee SH, Ha SH, Lee GC (2015) Treatment for concurrent ipsilateral femoral neck and shaft fractures using reconstruction nail with temporary K-wires. J Korean Fract Soc 28: 23-29.

111. von Rüden C, Tauber M, Woltmann A, Friederichs J, Hackl S, et al. (2015) Surgical treatment of ipsilateral multi-level femoral fractures. J Orthop Surg Res 10: 7.

112. Pauwels F (1935) Der Schenkelhalsbruch. Ein mechanischesproblem. Stuttgart, F. Enke.

113. Marsh JL, Slongo TF, Agel J, Broderick JS, Creevey W, et al. (2007) Fracture and Dislocation Classification Compendium – 2007: Orthopaedic Trauma Association Classification, Database and Outcomes Committee. J Orthop Trauma 21: S1-S163.

114. Garden RS (1961) Low-angle fixation in fractures of the femoral neck. J Bone Joint Surg B 43: 647-663.

115. Winquist RA (1993) Locked Femoral Nailing. J Am Acad Orthop Surg 1: 95-105.

116. Gustilo RB, Anderson JT (1976) Prevention of infection in the treatment of one thousand and twenty-five open fractures of long bones: retrospective and prospective analyses. J Bone Joint Surg Am 58: 453-458.

117. Starr AJ, Bucholz RW (2001) Fractures of the shaft of the femur. In: Bucholz RW, Heckman JD Rockwood and Green's Fractures in Adults (5th edn) Lippincott Williams and Wilkins , Philadelphia 1683-1730.

118. Melis GC, Guido P, Rossi F, Pinna P, Sotgiu F (1990) Segmental femoral fractures: surgical strategies. Ital J Orthop Traumatol 16: 515-526.

119. Turen CH, Lyon TR, Phipps M (2000) Vertical shear fractures of the femoral neck: a unique injury with specific mechanisms and associated injuries. 24th Annual Meeting of the Orthopaedic Trauma Association, San Antonio, TX.

120. Zettas JP, Zettas P (1981) Ipsilateral fractures of the femoral neck and shaft. Clin Orthop Relat Res: 63-73.

121. Linna KF, Schildhauer TA, Henley MB (2002) An occult ipsilateral vertical fracture of the femoral neck associated with high-energy mid shaft femur fracture. AJR Am J Roentgenol 178: 428.

122. Heine JP, Leeson MC, Vrabeć GA (2009) Delayed diagnosis of an ipsilateral femoral neck fracture with an associated femoral shaft fracture in light of a negative computed tomography scan. J Trauma 67: E129-131.

123. Swiontkowski MF, Hansen ST Jr, Kellam J (1984) Ipsilateral fractures of the femoral neck and shaft. A treatment protocol. J Bone Joint Surg Am 66: 260-268.

124. Christie J, Court-Brown C (1988) Femoral neck fracture during closed medullary nailing: brief report. J Bone Joint Surg Br 70: 670.

125. Alho A, Stromsoe K, Ekeland A (1991) Locked intramedullary nailing of femoral shaft fractures. J Trauma 31: 49-59.

126. Simonian PT, Chapman JR, Selznick HS, Benirschke SK, Claudi BF, et al. (1994) Iatrogenic fractures of the femoral neck during closed nailing of the femoral shaft. J Bone Joint Surg Br 76: 293-296.

127. Wu XB, Sun L, Wang MY, Jiang XY, Wu Y (2006) Diagnosis and treatment of the femoral shaft fractures combined with ipsilateral occult femoral neck fractures. Zhonghua Wai Ke Za Zhi 44: 535-537.

128. Haidukewych G (2007) Intracapsular hip fractures. In: Stannard JP, Schmidt AH, Kregor PJ Surgical Treatment of Orthopaedic Trauma. Thieme Publications, New York, NY 539-561.

129. Harper MC, Henstorf J (1986) Fractures of the femoral neck associated with technical errors in closed intramedullary nailing of the femur. Report of two cases. J Bone Joint Surg Am 68: 624-626.

130. Hughes SS, Voit G, Kates SL (1991) The role of computerized tomography in the diagnosis of an occult femoral neck fracture associated with an ipsilateral femoral shaft fracture: case report. J Trauma 31: 296-298.

131. Yang KH, Han DY, Park HW, Kang HJ, Park JH (1998) Fracture of the ipsilateral neck of the femur in shaft nailing. The role of CT in diagnosis. J Bone Joint Surg Br 80: 673-678.

132. Wojcik K, Nowak R, Chmielewski A, Ochenduszka ST (2009) Concomitant ipsilateral femoral neck and shaft fractures--analysis of cases. Ortop Traumatol Rehabil 11: 271-279.