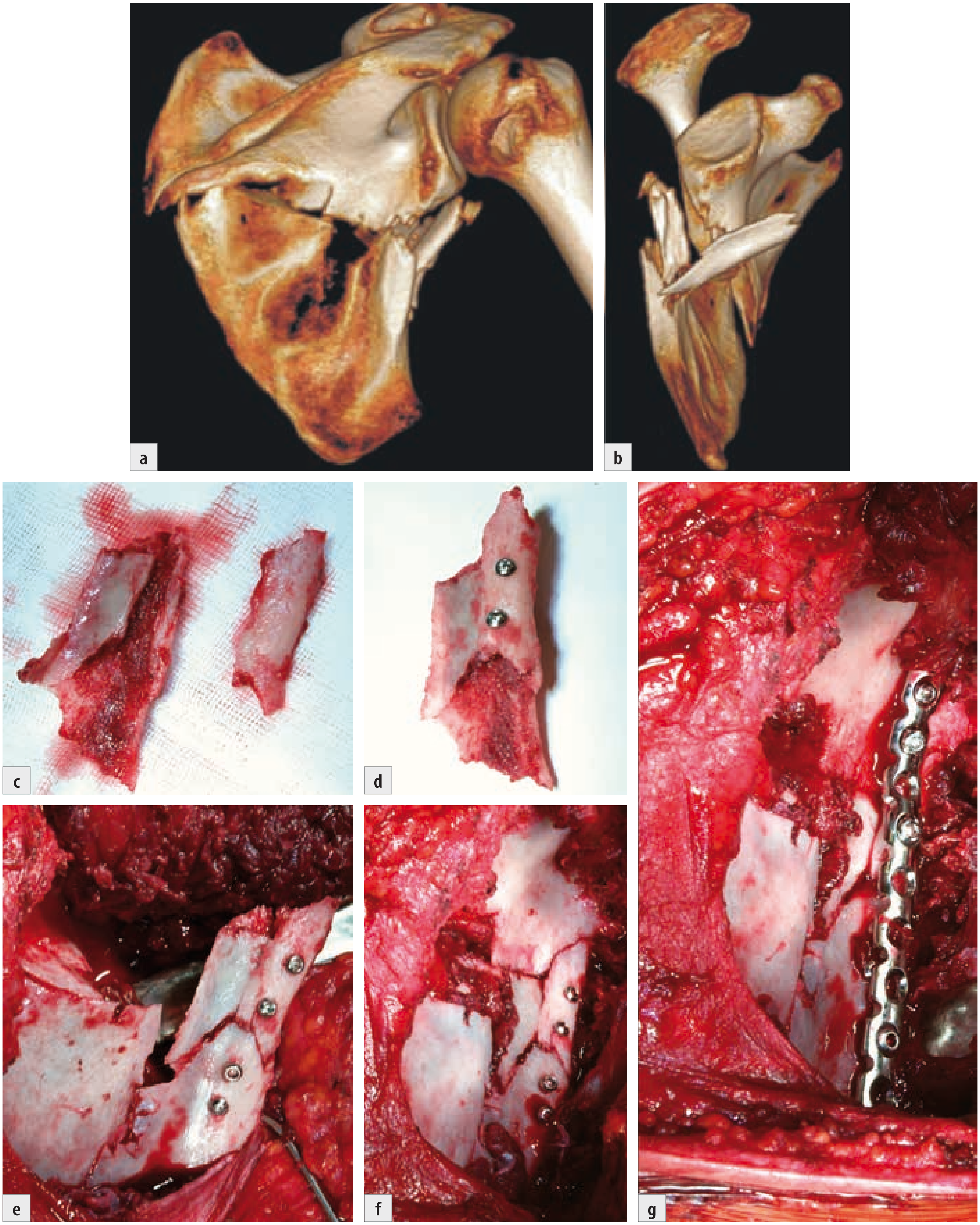

Fig. 11-8 Reduction and stabilization of a defective fracture of the lateral pillar of type 2b: a) a two-part infraspinous fracture of the scapular body; b) separation of a segment of the lateral pillar split longitudinally into two intermediate fragments; c) the two intermediate fragments; d) creation of one intermediate fragment using two 2.7-mm lag screws; e) fixation of the intermediate fragment to the distal fragment of the lateral pillar by two 2.7-mm lag screws; f) restoration of continuity of the lateral pillar; g) stabilization of the lateral pillar by a 3.5-mm reconstruction plate.

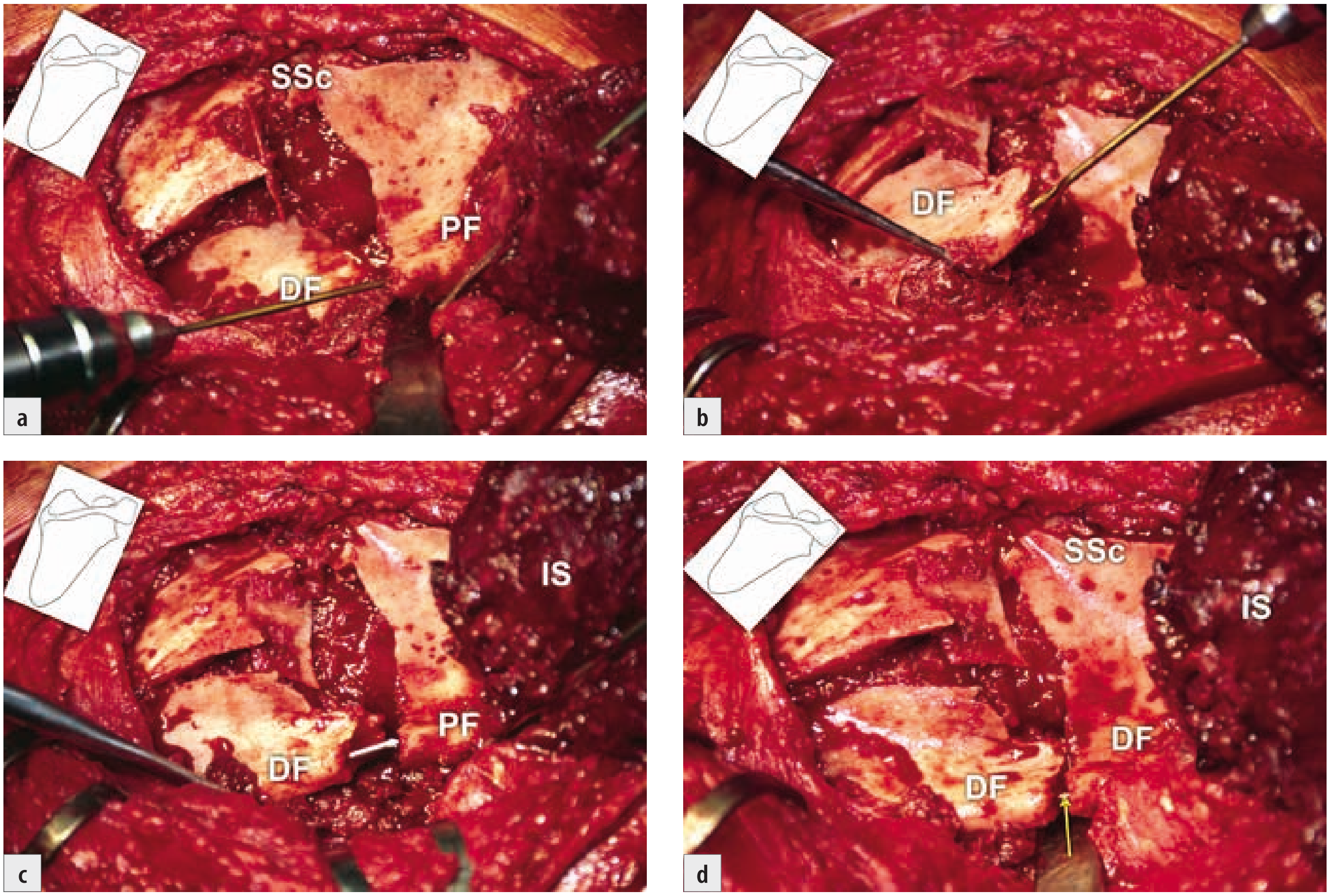

Fig. 11-9 The lost K-wire technique in a comminuted fracture of both pillars of the scapular body: **a)** a 2.5-mm drill bit is used to create a hole in the proximal fragment of the lateral pillar; **b)** the same procedure is used in the distal fragment; **c)** a shortened 1.5-mm K-wire is inserted into the hole in the distal fragment; **d)** the wire is inserted into the hole in the proximal fragment. **DF** – distal fragment of the lateral pillar, **IS** – reflected infraspinatus, **PF** – proximal fragment of the lateral pillar, **SSc** – scapular spine.

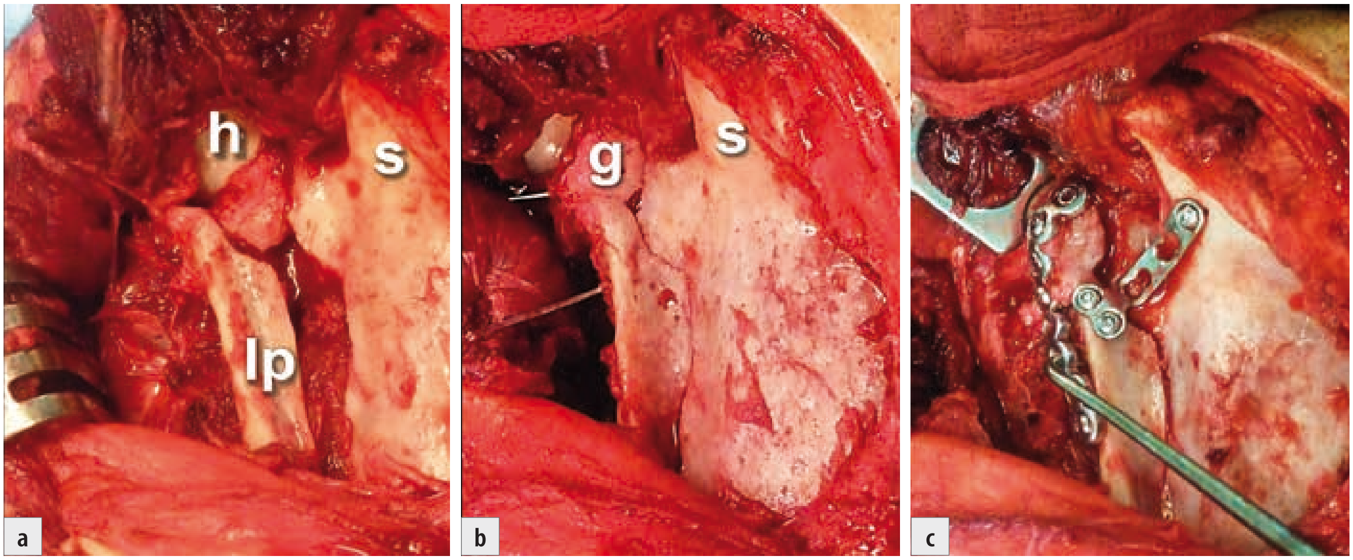

Fig. 11-10 Reduction and temporary transfixation of a fracture of the inferior glenoid and the lateral pillar of the left scapula using a K-wire via the Judet approach: **a)** prior to reduction; **b)** anatomic reduction of the glenoid fragment and the lateral pillar, and transfixation of both fragments by a K-wire; **c)** internal fixation by 2.7-mm plates.

A semitubular, reconstruction, or straight plate is used, depending on the fracture stability. In some cases, we used two parallel plates (Fig. 11-13). The plate is typically placed on the posterior surface of the lateral pillar. Only in certain cases can it be attached to its lateral surface which, however, requires a more extensive release of the attached muscles. Care should be taken to prevent slipping of the drill bit off the bony mass of the lateral pillar, by using a firmly held drill guide. In simple fractures of the lateral border it is sufficient to use 2+2 plate fixation, i.e., two screws in each of the two fragments. In fractures of the lateral border with intermediate fragments, a more stable 3+3 fixation is preferred. Screw lengths usually range between 10 and 14 mm.

Fractures with a long fragment separated from the lateral pillar, sometimes also bearing part of the articular surface of the glenoid, are fixed by T- or L-shaped plates connecting the lateral pillar with the base of the scapular spine (Fig. 11-14).

FRACTURES OF THE SPINAL PILLAR

Reduction and fixation of the spinal pillar (the scapular spine) are usually straightforward in simple fractures: they are mostly performed after reduction and internal fixation of the lateral pillar, which will usually also improve the position of fragments of the spinal pillar. A problem may occur in case of comminution of the scapular spine, when it is sometimes necessary to improvise and use, for instance, a wire-loop (Fig. 11-15), or the technique of the lost K-wire performed as described above for the lateral pillar (Figs. 11-16, 11-7).

Fractures of the spinal pillar are preferably fixed using a 2.7-mm reconstruction plate, placed on its posterior surface (the spine crest). The scapular spine offers adequate bony mass to anchor screws and simple fractures are sufficiently managed with a plate fixed by two screws inserted into each of the two fragments. In certain cases it is possible also to use a lag screw

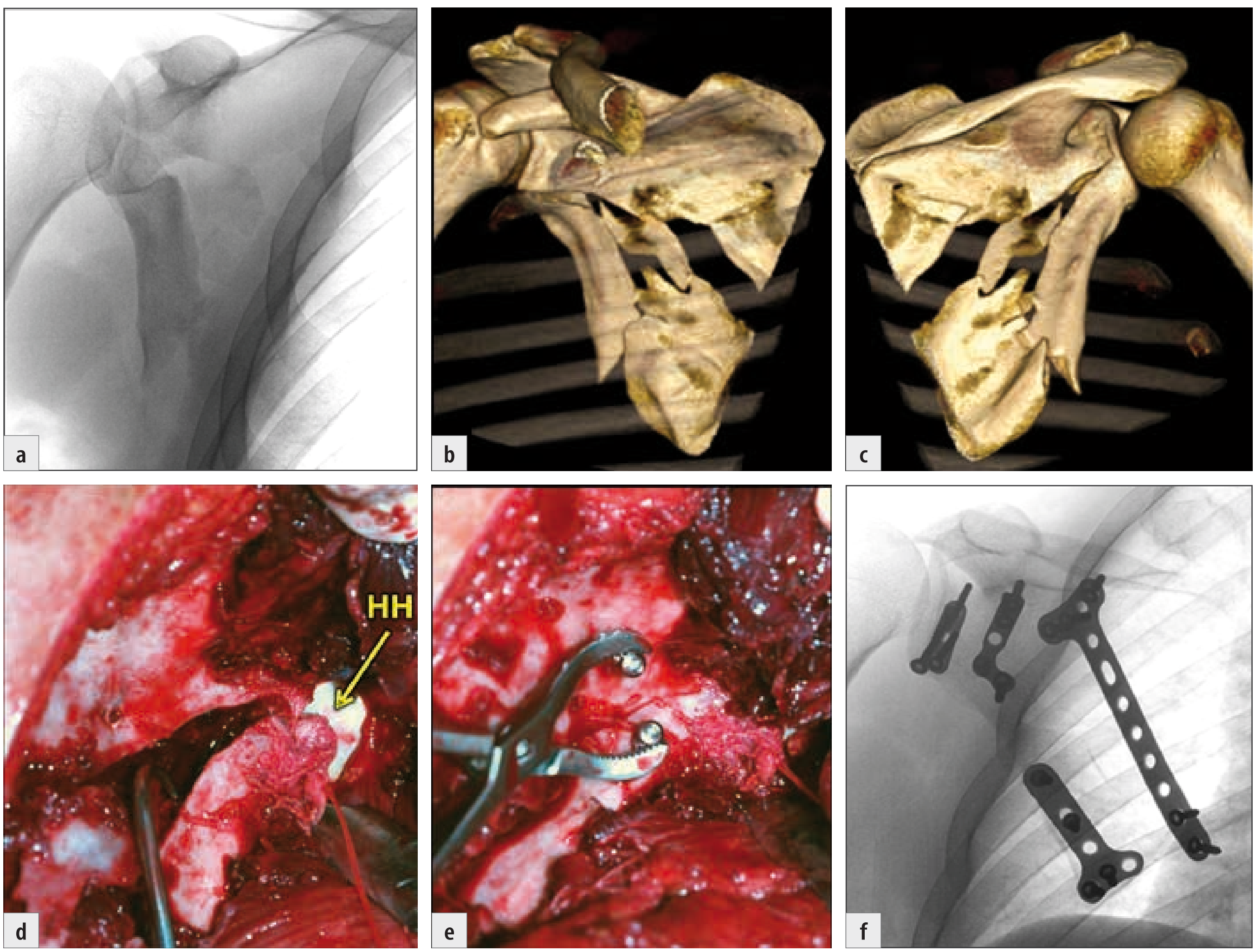

Fig. 11-14 Reduction and internal fixation of a long glenoid fragment: **a)** radiograph of a fracture of the inferior glenoid and infraspinous part of the body; **b)** 3D CT reconstruction, anterior view; **c)** 3D CT reconstruction, posterior view; **d)** intraoperative image, a view from the Judet approach; **e)** anatomical reduction using a pair of screws and bone forceps; **f)** postoperative radiograph. HH – humeral head.

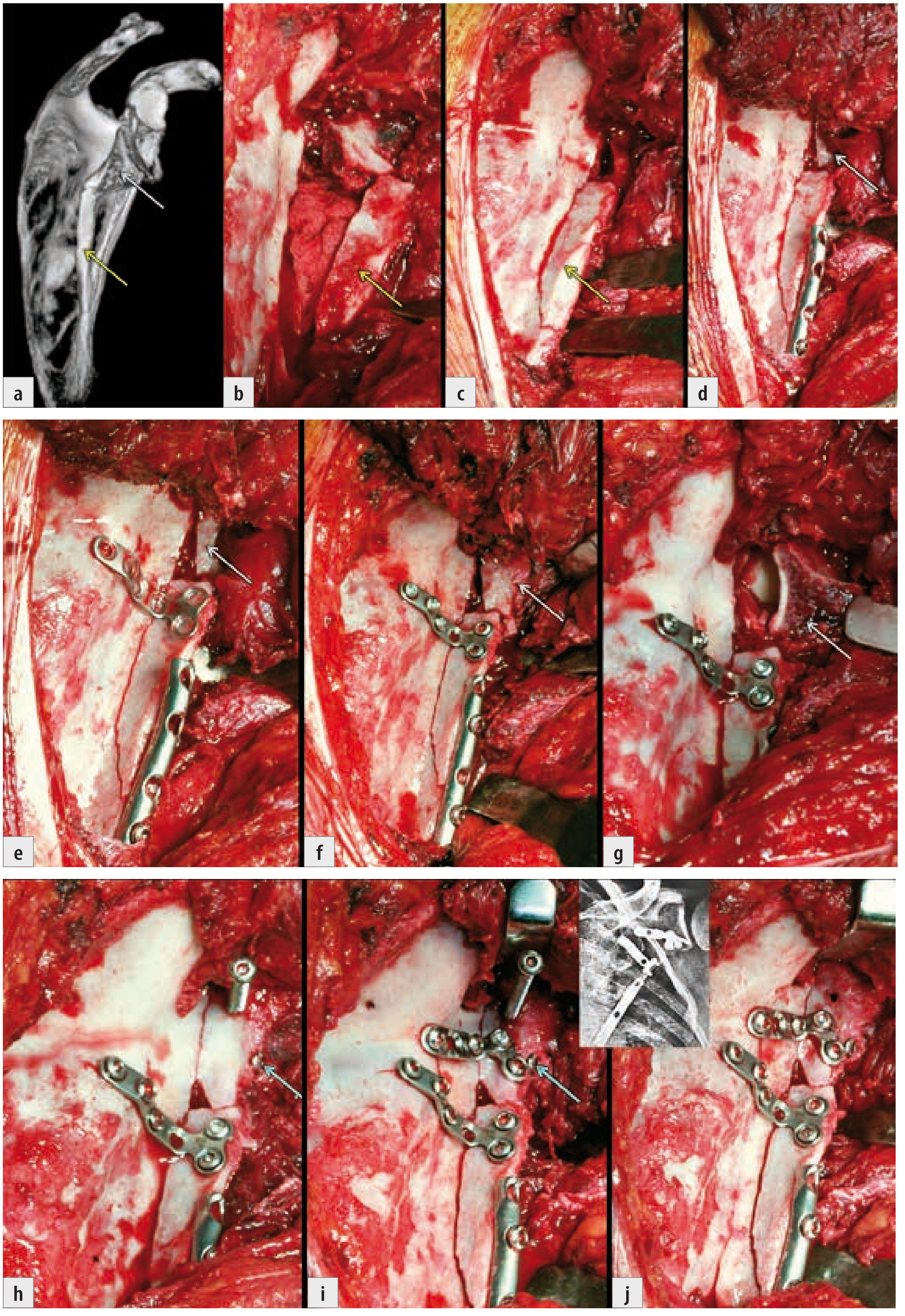

Fig. 11-29 Reconstruction of a fracture of the inferior glenoid and the lateral pillar: a) 3D CT reconstruction of the fracture – lateral view; b) intraoperative photograph prior to reduction; c) reduction of an extraarticular fragment of the lateral pillar; d) fixation of the fragment by a shaped 3.5-mm semi-tubular plate as a buttress; e) placement of a contoured, 2.7-mm T-plate; f) fixation of the T-plate with screws, g) retraction of the fragment of the inferior glenoid, showing the humeral head; h) a 3.5-mm screw inserted into the glenoid fragment as a joystick; i) fixation by a 2.7-mm lag screw and a 2.7-mm T-plate; j) 3.5-mm joystick screw removed. White arrows indicate the fragment of the inferior glenoid, yellow arrows a separated fragment of the lateral pillar, blue arrows a lag screw stabilizing the inferior glenoid fragment.

12

FRACTURES OF THE SCAPULAR BODY

Fractures of the scapular body account for about one half of all scapular fractures. Despite this, little attention was paid in the past to this type of scapular injury in terms of diagnosis, classification and treatment. This may be explained by the fact that, until recently, almost all fractures of the scapular body were treated non-operatively and there was, therefore, no reason for analyzing them in detail [4, 23, 26, 27, 33, 37, 52]. However, some studies questioned universal non-operative treatment of scapular body fractures [1, 43, 47], while other authors recommended operative treatment only in markedly displaced fractures. In the last 30 years, the situation has changed and the number of indications for operative treatment of certain scapular body fractures has been increasing [8, 9, 14, 15, 17-19, 24, 30, 31, 34, 36, 42, 49, 51, 55, 57]. In this context, a new problem has arisen, related to the definition of these fractures. Historical publications clearly distinguished between scapular body and scapular neck fractures and presented exact illustrations of scapular body fractures, based on cadaver specimens [8, 20, 28, 29, 38, 54]. Despite this, a number of authors still classify these fractures as scapular neck fractures, particularly those with a fracture line passing across the proximal part of the lateral pillar [17, 32, 35]. Conflating these two fracture patterns results in terminological confusion, the presentation of unrealistic data on the incidence of scapular neck fractures and the floating shoulder, and contradictory outcomes of their treatment [12, 22].

EPIDEMIOLOGY

Data on the prevalence of scapular body fractures vary widely in the literature, ranging between 19% and 65% [27, 40, 41, 53, 56]. There are several reasons for that. One of them is the already-mentioned absence of a standard definition of scapular body factures, and their intentional classification as scapular neck fractures. Another reason may be different understanding of fractures of the superior and inferior angles of the scapula, when some authors [26, 33] classify them as scapular body fractures and others [10, 11, 13] consider them to be so-called corner body fractures. The third reason is the fact that, mainly in older studies, scapular body fractures were unintentionally confused with scapular neck fractures due to inadequate radiological diagnosis.

Zhang [56], in 2012, identified a total of 256 fractures of type OTA 14-A3 (scapular body fractures) in a series of 587 scapular fractures, i.e., in 44% of cases.

Tuček et al. [53], in 2017, recorded 52% of scapular body fractures in their series of 250 scapular fractures. The last review of our series of 519 scapular fractures from the period of 2002-2020 revealed scapular body fractures in 50% of cases. The exact fracture pattern was determined on the basis of CT examination and intraoperative findings.

DIAGNOSIS

An exact determination of a scapular body fracture, or its pattern, based on radiographs alone is extremely difficult, if not impossible. Many two-part infraspinous fractures of the scapular body have been interpreted, on the basis of radiographs alone, as fractures of the surgical neck of the scapula. Scapular body fractures can be reliably specified only by means of 3D CT reconstructions (**Fig. 12-1**) [7, 39], not only with the view of the anterior aspect, but, more importantly, of the posterior aspect, which shows the course of the fracture lines in relation to the scapular spine.

CLASSIFICATION

The first to classify scapular body fractures was Petit [48] in 1723. Another classification, by Tanton [50], was published as late as at the beginning of 20th century. This and all the subsequent schemes classified scapular body fractures according to involvement of the supraspinous and infraspinous fossae, or according to the course of fracture lines [21, 33]. These classifications are descriptive and do not address the severity of individual types of injury, or the methods of their treatment. A majority of recent classifications distinguish between two-part (non-comminuted) and multi-part (comminuted) fractures of the scapular body [5, 25, 44–46]. Some classifications mention this fracture pattern only marginally, if at all [1].

OVERVIEW OF CLASSIFICATIONS

The following overview shows that the first to deal in detail with scapular body fractures were primarily the French surgeons.

Petit [48], in 1723, classified these fractures according to the course of fracture lines into transverse, oblique and longitudinal ones.

Tanton [50], in 1915, divided scapular body fractures into four groups. The first group comprised fractures of the supraspinous and infraspinous fossae. Based on the course of the fracture line, he distinguished between vertical, transverse and comminuted fractures. The second group included fractures

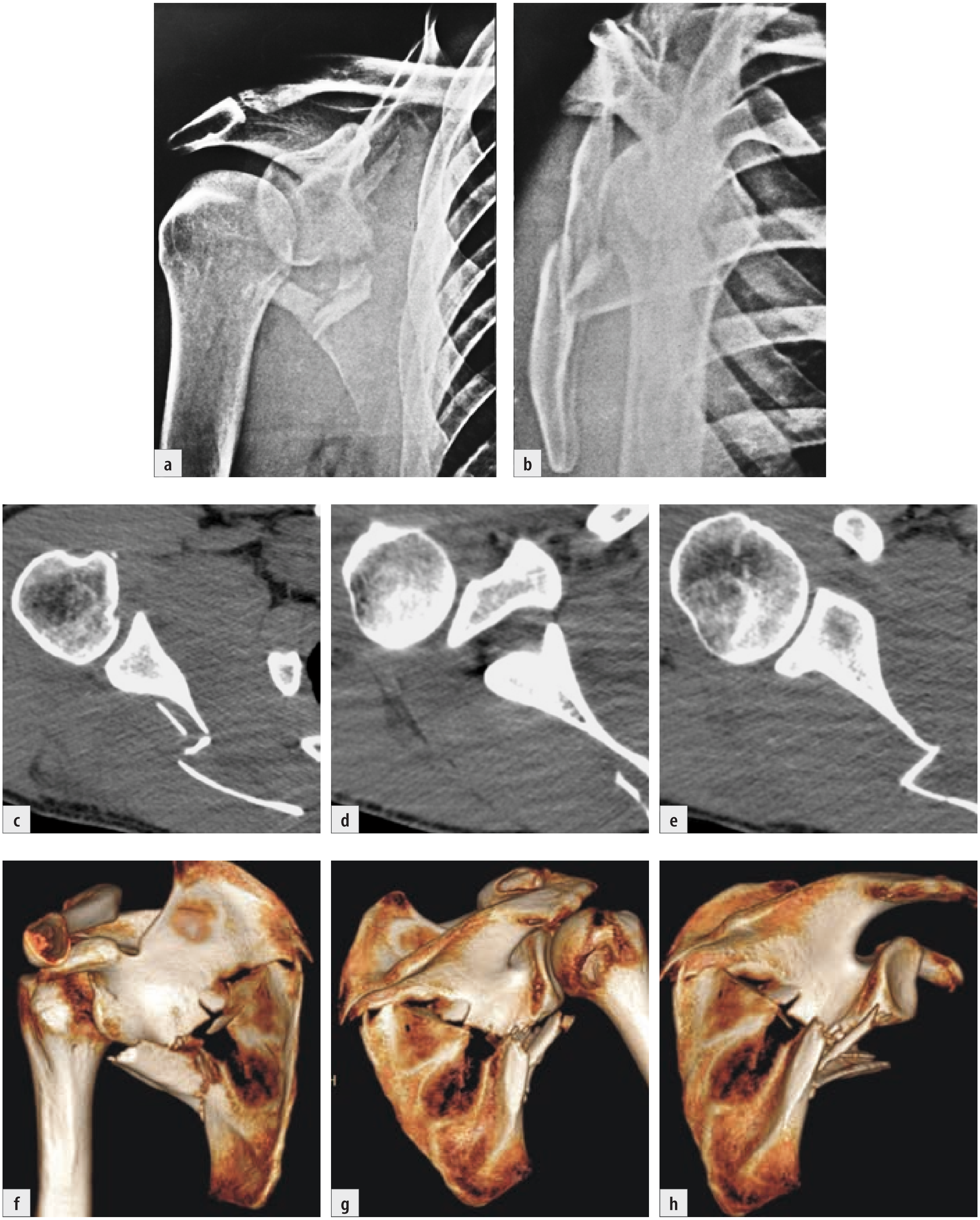

Fig. 12-1 Importance of 3D CT reconstructions for a proper determination of the fracture pattern: **a)** Neer I view; **b)** Neer II view; **c+d+e)** CT transverse sections at the level of the infraspinous fossa; **f)** 3D CT reconstruction, anterior view; **g)** 3D CT reconstruction, posterior view; **h)** 3D CT reconstruction, posterolateral view with subtraction of the humeral head. Only 3D CT reconstructions show that it is a two-part fracture of the infraspinous part of the scapular body, with two intermediate fragments separated from the lateral pillar.