Correspondence of radiographic incidences of the shoulder girdle between the French and Anglo-Saxon systems: literature review and national survey of medical imaging professionals in Benin.

Summary

The standardization of radiographic techniques is a major challenge for the training and practice of medical imaging professionals. Differences in nomenclature and description of the impact between the French and Anglo-Saxon systems can lead to errors of interpretation, pedagogical difficulties and heterogeneity of practices. This study aimed to establish a correspondence between the radiographic incidences of the shoulder girdle of the two systems and to assess their level of knowledge among Beninese professionals.

A descriptive cross-sectional study, combining a literature review and a national survey, was conducted from June to December 2021. Books and articles on shoulder radiographic techniques were identified in Medline, Scopus and WorldCat. The French and Anglo-Saxon incidences were compared according to their positioning, their guiding radius and their indications. A survey of medical imaging professionals practicing in Benin assessed their knowledge and practices.

Eight incidences have been identified in the French system compared to eleven in the Anglo-Saxon system. Several bearings had technical equivalence despite different names, including Railhac/AP neutral rotation, Lamy/PA Oblique, Neer/Supraspinatus Outlet, Axillary Profile/Axial Superior-Inferior and Garth/Garth. Other impacts were specific to a single system. The rate of knowledge of the incidences varied from 3.1 to 71.7% in the French system compared to 5.5 to 90.6% in the Anglo-Saxon system. The most commonly used incidences were those used in daily practice, while the specialized incidences remained poorly known.

There is a correspondence between several radiographic incidences of the shoulder girdle in the two systems. Harmonization of their nomenclature could improve training, communication between professionals, the quality of radiographic examinations and the interpretation of examinations.

Keywords: incidences; French system; Anglo-Saxon system; correspondence.

Introduction

Medical imaging includes all the techniques that make it possible to visualize a part of the human body or an organ, by creating a comprehensible visual image of medical information in order to establish a diagnosis and make an appropriate follow-up of the treatment [1].

Conventional radiology, mainly osteoarticular, indicated as a first-line treatment for all diseases of the musculoskeletal system, accounts for more than half of the radiological procedures performed in daily private practice or hospital[2].

It is sufficient in many situations to allow a precise diagnosis and to establish therapeutic indications [3,4].

The mastery of the various incidences of the different regions of the body involves the teaching of radiographic techniques. The purpose of the incidences is to present the structures or organs explored through the different projections or orientations in the X-ray images. They thus make it possible to assess the lesions of the target structures from different angles of view. The implications taught are generally drawn from books that are collections and therefore can vary from one educational system to another. This reality is all the more striking in French-speaking and Anglo-Saxon universities.

The aim of this work was to establish a correspondence between the radiographic incidences of the shoulder girdle in the Anglo-Saxon system and in the French system through a literature review.

Materials and methods

Setting and type of study

The study was carried out in Benin's public and private medical imaging services. This is a cross-sectional descriptive study combining a systematic review of the literature and a multicenter survey of medical imaging professionals over a period of 6 months.

This study included all medical imaging professionals (technicians, medical imaging specialists, radiologists) practising in Benin and who had given their consent.

Collectionand analysis methods

We had collected the relevant documents (documents of radiographic techniques), articles relating to the description of radiographic techniques of the shoulder girdle (name of the incidence, description of the positioning, central radius).

We had searched for scientific articles on the positioning of radiographic incidences in the various bibliographic databases such as *Medline, Scopus* at first. Secondly, we searched for references to books on radiographic effects within *Worldcat*.

A document was considered to be of the Anglo-Saxon system when the authors came from and intervened in an Anglo-Saxon country; A document was French when the authors are French.

We had identified the different incidences of the shoulder girdle from these different sources of information. This information allowed us to write our survey sheet. To achieve this, we have grouped these incidences into main groups, namely: frontal bearings, profile bearings, axial bearings, oblique bearings.

This survey sheet was submitted to medical imaging professionals, in order to estimate their knowledge and usual practices in relation to the impacts of the two systems.

We had carried out a descriptive analysis through the creation of tables and graphs with the R.0.4 software

Results

Socio-demographic characteristics

Table 1 shows the distribution of the professionals surveyed by sex, occupation and seniority.

Table 1: Distribution of professionals surveyed by sex, occupation and seniority

Variables	Absolute Frequency	Relative Frequency
Gender		
Female	**60**	**47.2**
Male	**67**	**52.8**
Profession		
ESD/Radio	**4**	**3.1**

Engineer/Master's degree	**39**	**30.7**
Radiologist	**2**	**1.6**
Technician/License	**82**	**64.6**
Seniority		
0 to 5 years	**39**	**30.7**
6 to 10 years	**41**	**32.3**
11 to 20 years	**32**	**25.2**
21 and over	**15**	**11.8**

From the analysis of this table, the subjects of our study were mostly male (52.8%) with a sex ratio equal to 1.12.

Technicians were more represented in this study with a rate of 64.6%. The seniority bracket in the most represented corporation was (6 to 10 years) with a rate of 32.4%.

Tables 2, 3, 4 and 5 describe the profile and axial incidences of the shoulder girdle in the Anglo-Saxon system and the French system.

Table 2: Incidence of the shoulder girdle from the front of the two systems

Category	**Systems**	**Positioning**	**Centering**
FACE (neutral, internal, external rotations) [4,21–23]	Anglo-saxon	Patient lying down or standing	Vertical or horizontal RC indicates the Coracoid Process
	English Double obliquité	Patient standing or sitting at a posterior oblique of 30 to 45°	Angulated 20 to 25° caudad indicates the subacromialdimple
FACE Glenoid cavity or GRASHEY incidence [2,21]	Anglo-saxon	Patient lying down Midplane of the body is 45° with the table	CR indicatesscapulohumeral joint
Strict Face or Railhac Bearing [4,23]	English	Patient lying down Neutral rotating arm	Radius centered on the subacromial dimple

Trans axillary PA (Hobbs modification) [21]	Anglo-saxon	Patient lying or standing, examined arm elevated, head facing opposite side	Radius centered on the glenohumeral joint
Liotard's Face Incidence [23]	English	Patient seated in front of the X-ray tube, head turned to the opposite side, (rotationindifferent); While maintaining lumbar contact, the subject leans forward with his back rounded.	RD inclined cranio-caudal of 15 to 20° is centered on the acromion;

Table 3: Axial profile and axial bearings of the shoulder girdle of the French system [4,5,6]

Incidences	Positioning	Centering
Subacromial profile (Neer's profile, Lamy's profile)	OPA patient from 40 to 60° RD parallel to the major axis of the supraspinatus muscle and tangential to the scale of the scapula	RC horizontal (Lamy) Angled RC caudad 0 to 20° (Neer).
Profile of BLOOM and OBATA	Patient standing or sitting in mild hyperlordosis and OAP on the side to be X-rayed	Vertical ray centred on the tip of the acromion.
Glenoid Profile	Standing, in OPA of about 45°. Arm in 180° abduction, elbow flexed, hand resting on head	Radius descending about 30°, centred on the stump of the shoulder girdle.
Axillary profile	Seated patient Arm in 45° abductionand cassette placed in the axillary hollow.	Radius inclined 10 ° towards the elbow centered 5 cm inside the acromion.
Incidence of GARTH (AP Apical Oblique)	Seated at a posterior oblique of 45°, elbow flexed. The palm of the hand rests on a contralateral shoulder girdle.	Flexed elbow RC angulated 45° caudad centered on the humeralhead

Table 4: Incidence of the shoulder girdle of the shoulder girdle of the French system (continued) [4,5,6]

Incidences	Positioning	Centering
Subacromial profile (Neer's profile, Lamy's profile)	OPA patient from 40 to 60° RD parallel to the major axis of the supraspinatus muscle and tangential to the scale of the scapula	RC horizontal (Lamy) Angled RC caudad 0 to 20° (Neer).
Profile of BLOOM and OBATA	Patient standing or sitting in mild hyperlordosis and OAP on the side to be X-rayed	Vertical ray centred on the tip of the acromion.
Glenoid Profile	Standing, in OPA of about 45°. Arm in 180° abduction, elbow flexed, hand resting on head	Radius descending about 30°, centred on the stump of the shoulder girdle.
Axillary profile	Seated patient Arm in 45° abductionand cassette placed in the axillary hollow.	Radius inclined 10 ° towards the elbow centered 5 cm inside the acromion.
Incidence of GARTH (AP Apical Oblique)	Seated at a posterior oblique of 45°, elbow flexed. The palm of the hand rests on a contralateral shoulder girdle.	Flexed elbow RC angulated 45° caudad centered on the humeralhead

Table 5 : Profile and axial bearings of the shoulder girdle in the Anglo-Saxon system [7,8]

Incidences	Positioning	Centering
Transthoracic	Standing or DD Examined Arm Supported Lifting the opposite arm above the head	RD is directed through the thorax to the level of the affected humeral neck.
PA oblique	Standing in anterior oblique	RD directed to the scapulohumeral joint
Supraspinatusoutlet (Neer'smethod)	Standing or lying down Rotate the patient in OPA by 45°–60°	RD ⊥ to the scapulohumeral joint inclines 10 to 15° caudad
Superior-inferior axial	Patient sitting at the edge of the table or on a chair.	RD inclined 5 to 15° (toward the elbow) through the shoulder girdle joint
Infero-superior axial (Axial profile)	Patient in DD, at the edge of the table with a support under the shoulder girdle	RD horizontal, inclined 25°–30° medially towards the axillary hollow
Apical axial AP	Patient in AP, standing without rotation	RD is inclined at 30° caudad and between 12 inches (1.25 cm) above the coracoid process
Garth's incidence	Standing in a 45° OAP with support for the shoulder girdle to be examined, elbow on the side examined in flexion, place the hand on the opposite shoulder girdle.	RD 45° caudal, centered on the inner part of the humeral scapula joint
Tangential sulcus Bicipital Intertuberositary Groove (Fisk Variant)	Supine position; palpate the humeral head anteriorly to locate the splint.	Patient tilts forward 15°–20°, vertical RD indicates aligner

Alignment of Impacts

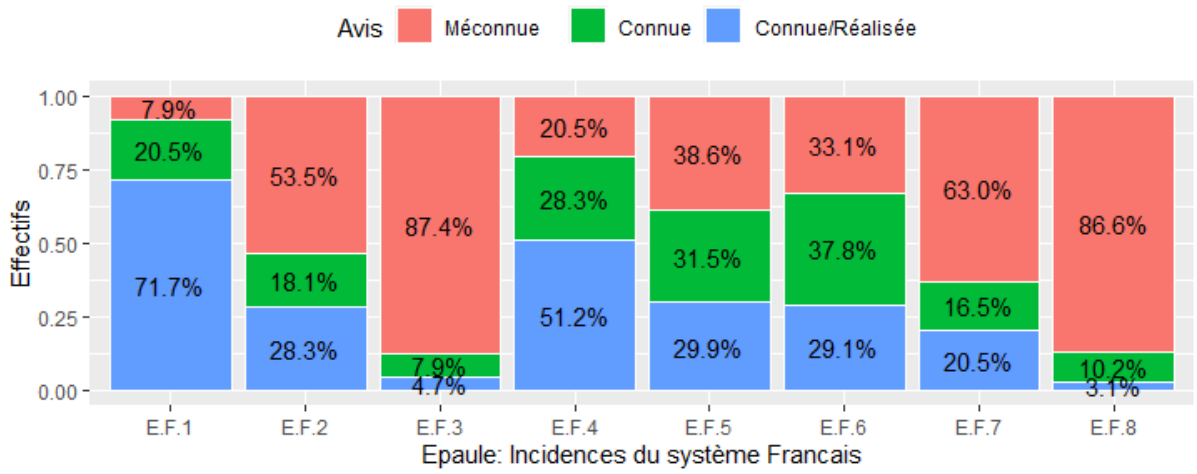
The correspondence between the French and Anglo-Saxon incidences of the shoulder girdle is described in Table 6.

Table 6: Incidences of the shoulder girdle performed in the French and Anglo-Saxon systems

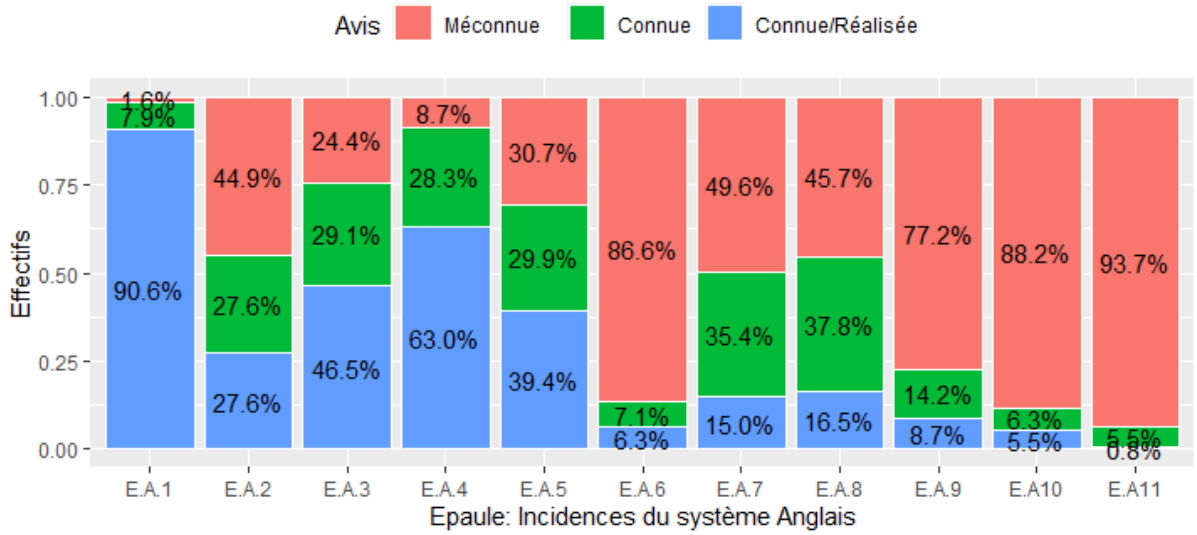
	FACE	PROFILE AND AXIAL
FRENCH SYSTEM	- Double-obliquity face, neutral, internal, external rotation - Strict Face or Railhac Incidence - Liotard's face incidence **(n=3)**	- Subacromial profile (Neer's profile, Lamy's profile) - Glenoid profile or Bernageau incidence - Axillary profile - Bloom and Obata's Profile - Garth's incidence **(n=5)**
ANGLO-SAXON SYSTEM	- Antero-posterior neutral, internal, external rotation - Transaxillary AP (Hobbs modification) - Glenoid cavity (Grashey's position) **(n=3)**	- Transthoracic lateral - PA oblique -Supraspinatus outlet - Upper lower axial - Upper lower axial - Apical axial AP - Garth's incidence - Tangential sulcus : Bicipital Intertuberositary Groove (Fisk Variant) **(n=8)**

Table 6 summarizes the different front, profile and axial incidences of the shoulder girdle performed in the French and Anglo-Saxon systems. Eight (8) incidences were identified for the French system, including three (3) for the face, five (5) for the profile and the axial. Eleven (11) incidences were identified for the Anglo-Saxon system, including three (3) for the face and eight (8) for the profile and axial

The level of knowledge of the incidences according to the French and Anglo-Saxon system of the shoulder by professionals in medical imaging was summarized in Figure 1



109



110

111 **Figure 1 :** Opinion on the knowledge of the impacts of the Shoulder

112 **Legend:**

113	Double obliquity face	E F 1	Posterior anterior	E A 1
114	Incidence de Railhac	E F 2	PA transaxillaire	E A 2
115	Liotard's Face	E F 3	Grashey Glenoid Cavity	E A 3
116	Subacromial profile	E F 4	Transthoracic lateral	E A 4
117	Glenoid profile	E F 5	PA oblique	E A 5
118	Axillary profile	E F 6	Supra spinatus outlet	E A 6
119	Bloom and Obata's Profile	E F 7	Lower upper axial	E TO 7

Garth's incidence	E F 8	Upper inf axial	E TO 8
		Apical axial AP	E A 9
		Garth's incidence	E TO 10
		Tangential sulcus	E A 11

Figure 1 represents the estimate of the knowledge of medical imaging professionals in Benin on the impacts recorded on the shoulder girdle of the two systems (French and Anglo-Saxon). The analysis of this graph shows that the rate of incidences known and carried out by professionals varies from 3.1 to 71.7% for the French system and from 5.5 to 90.6% for the Anglo-Saxon system.

Discussion

Conventional radiography remains an essential examination for the management of musculoskeletal conditions and more particularly for the management of osteoarthritis. It is the standard tool for investigating the progression of osteoarthritis symptoms in the various anatomical parts of the body [9]. This usefulness of radiography is more marked for the exploration of the shoulder girdle, in view of the large number of radiographic incidences noted in the literature [2,7]

Of the different front, profile and axial incidences of the shoulder girdle performed in the French and Anglo-Saxon systems, eight (8) incidences were identified for the French system, including three (3) for the face, five (5) for the profile and the axial. Eleven (11) incidences were identified for the Anglo-Saxon system, including three (3) for the face and eight (8) for the profile and axial

Some French incidences have their correspondence with the Anglo-Saxons. Impact of the strict face or Railhac incidence [4,7,8] which corresponds to the anterior-posterior neutral rotation incidence of the Anglo-Saxon system [8]allows to look for a massive rupture of the rotator cuff and a lower osteophytosis that can cause subacromio-deltoid impingement. L'Lamy profile incidence of the French system [4,10] has its Anglo-Saxon correspondence which is the oblique PA incidence [7]; similarly, the Neer incidence of the French system corresponds to the Supraspinatus outlet incidence of the Anglo-Saxon system[4,7]. The subacromial profile (Lamy, Neer or Coiffe profile) allows the study of the acromio-coracoid vault, the spatial location of

tendon calcifications, the analysis of the coracohumeral space and the detection of acromial enthesophytes in the anterior inferior part [5,6].

The axillary (seated) profile incidence of the French system corresponds to the superior-inferior axial incidence of the Anglo-Saxon system, and the supine axillary profile of the French system corresponds to the inferior superior axial incidence; It makes it possible to look for calcifications or erosion within the infraspinatus tendons, to see the coracoid process [5,7,8,10]. Garth's Impact of the French system is identical to the Garth incidence of the Anglo-Saxon system, it is adoes not have a good impact in the case of acute trauma of the shoulder girdle to highlight dislocations, fractures of the glenoid [4,7,8].

Impacts such as: Grashey's incidences, transaxillary PA incidence, transthoracic lateral incidence, tangential sulcus intertuberostic gutter (bicipital), the axial apical AP for the Anglo-Saxon system and Impacts face of Liotard, Glenoid profile or Bernageau incidence [1], profile of Bloom and Obata, for the French system have no points of resemblance.

The glenoid cavity incidence (Grashey's position) is a special incidence to visualize the Glenoid cavity in profile with clearance of the joint space [7]. The transaxillary PA incidence (Hobbs modification) shows a profile view of the proximal part of the humerus in relation to the glenohumeral joint [8]. The transthoracic incidence of the Anglo-Saxon system is useful in the study of calcifications and dislocations; This is the only incidence where the patient is laterally. The apical axial incidence AP is an incidence that demonstrates the narrowing of the acromiohumeral space. As to the impact intertuberostic (bicipital) gutter, it gives a profile view of the humeral tubercles and intertuberositary splint [2,8].

Liotard's front incidence allows us to assess the size and morphology of the anterior inferior beak of the acromion, especially before acromioplasty [10]. The glenoid profile is practiced in research a fracture of the anterior inferior edge of the glenoid [4]. The incidence profile of Bloom and Obata, is interesting in the assessment of posterior instability and to look for a MacLaughlin notch (fracture-deposition of the anterior superior part of the humeral head) in a patient whose shoulder girdle is not movable [5,12].

We can then conclude that the most commonly used front radiographic incidences of the shoulder girdle of the two systems are practically the same, with the only difference that the French system looks for the subacromioclavicular space and the scapulohumeral space in addition to the bone

structures by operating a double obliquity. Also, the axial and profile bearings of the shoulder girdle of the two systems have similarities, but above all with different names.

Conclusion

This study shows that a significant proportion of the radiographic effects of the shoulder girdle have a technical equivalence between the French and Anglo-Saxon systems, despite terminological differences. The most commonly used incidences have similar diagnostic objectives, while some projections remain specific to a single system. The development of a harmonised nomenclature would promote the standardisation of teaching, improve communication between professionals and help to optimise the quality of radiographic examinations.

Acknowledgements

The authors thank the administrative authorities of the Hubert Koutoukou MAGA National University Hospital Center (CNHUHKM) for authorizing this research. They also express their thanks to the various health workers in these health facilities who facilitated the collection of data.

Funding

The authors did not receive any financial support for the research, writing, and/or publication of this article.

Conflicts of interest

The authors declare that there is no conflict of interest in relation to this research and this article.

Data availability statement

The data is available in the Excel database and is used as part of an end-of-cycle dissertation. These documents are accessible through a link that can be shared upon reasoned request.

Ethics approval

The research project has the authorization of the management of the Hubert Koutoukou MAGA National University Hospital Center (CNHUHKM) before the start of the study.

Statement of informed consent

The free and informed consent of patients and their parents, as appropriate, was obtained prior to their inclusion in the study. The anonymity of the data has been respected. All the data collected was analysed and presented anonymously.

References

1. [People's Democratic Republic of Algeria] Mohamed Khider University, Biskra; 2020 [cited 2021 Nov 29].http://archives.univ-biskra.dz/bitstream; 37p
2. Bléry M. Positions and incidences in conventionalradiology: apractical guide. French edition. Issy-les-Moulineaux: Elsevier Masson; 2011. 330 p.
3. Blondiaux E, Cochet A, Durand E, Kremer S, Montadon M, editors. Medicalimaging: the fundamentals of radioanatomy, biophysics, techniques and semiology in radiology and nuclearmedicine. Issy-les-Moulineaux: Elsevier Masson; 2017. 370 p.
4. Sobczyk M. Guide to Positions and Incidences in Osteoarticular Radiology. SAS, 62, rue Camille-Desmoulins, 92442Issy-les-Moulineaux: Elsevier-Masson; 2013. 340 p.
5. Denis A, Vial J, Sans N, Loustau O, Chiavassa-Gandois H, Railhac J-J. Shoulder X-rays: Useful Incidences in Current Practice. Journal of Radiology. 2008;89: 620–30.
6. Info-radiology. Shoulder X-rays [Internet]. Info-radiology. [cited 2021 Oct 3].https://www.info-radiologie.ch/radiographie_epaule.php
7. Long BW, Smith BJ, Merrill V. Merrill's atlas of radiographic positioning & procedures. Thirteenth edition. St. Louis, Missouri: Elsevier; 2016. 1771 p.
8. Lampignano J., Kendrick E., Bontrager L. radiographic positioning and related anatomy. 9è edition. 3251 Riverport Lane St. Louis, Missouri 63043: Elsevier; 2018. 830 p.
9. Hayashi D, Roemer FW, Guermazi A. Imaging of osteoarthritis-recent research developments and future perspective. Br J Radiol. 2018; 91.
10. Rudel M, Laredo J-D. Osteoarticular X-ray techniques: know-how. Montpellier: Sauramps medical; 2009. 116 p.
11. Akhramez F. The long-term outcomes of abutment in redicitive shoulder dislocations [Internet]. Mohammed V University - Souissi; 2011 [cited 2022 Jan 24]. http://ao.um5.ac.ma/xmlui/handle/123456789/247.168p
12. Boster IB, Shapira S, Oran A, Avivi E, Pritsch M. Significance of plain radiography in shoulder pain diagnosis sep; 150(9):742-6. harefuah; 2011; : 749p.