Anatomic total shoulder arthroplasty is a widely used definitive surgical solution for end-stage glenohumeral joint osteoarthritis and is associated with good clinical outcomes. Anatomic total shoulder arthroplasty has a role for patients under 50 years of age who have exhausted nonoperative management and for patients over 80 years of age with an intact rotator cuff. Patients younger than 50 place greater demands on their replaced shoulders, raising concerns about implant survivorship and in particular the failure of the glenoid component. There are limited data on the long-term survivorship of anatomic total shoulder arthroplasty in patients under the age of 50 years in the literature. Modern bone-preserving designs utilizing newer materials may contribute to improved outcomes and survivorship. Achieving comparable functional outcomes in patients over 80 years of age remains a challenge with concerns related to rotator cuff failure. However, in appropriately selected patients over the age of 80 years, an anatomic total shoulder arthroplasty provides better pain relief and function than a reverse total shoulder arthroplasty.

Keywords
Total shoulder replacement · Long-term survivorship · Shoulder prosthesis · Glenoid component · Glenohumeral joint

Introduction

Anatomic total shoulder arthroplasty (aTSA) has evolved over the past four decades to become a reliable surgical solution with satisfactory clinical outcomes and survivorship [1–4]. It is widely accepted as the gold standard treatment for the management of patients with end-stage glenohumeral joint osteoarthritis for who non-operative management has failed [5]. The number of patients undergoing aTSA continues to rise in parallel with other joint arthroplasties [6]. Despite the exponential growth in the use of reverse total shoulder arthroplasty (rTSA) in the last decade, aTSA continues to provide better functional outcomes than rTSA [7].

The average age of patients undergoing aTSA is 68.8 years [8]. But there is an increase in the use of aTSA in the two extremes of the normal age distribution curve, patients under the age of 50 years and those older than 80 years. The concern in the younger patients is in regard to implant survivorship, given the higher activity levels and greater functional demands, and in particular the failure of the glenoid component [5]. On the other hand, the concern in older adults is the achievement of comparable functional outcomes to the younger population and complications related to rotator cuff failure [9].

The aim of this review is to examine the existing literature on the outcomes for aTSA in the two extreme age groups (patients under 50 years and patients over 80 years of age) and to discuss important
factors that may have a role in enhancing survival and improving the function of these implants in the respective age groups.

**Considerations in patients under 50 years of age**

**Alternatives to aTSA**

The main factors to consider for aTSA in younger patients are the etiology of their shoulder pathology and the long-term survival. Saltzman et al. reported that only 21% of shoulder arthroplasties performed for patients younger than 50 were for osteoarthritis as compared with 66% for patients older than 50 [10]. The other indications for aTSA include rheumatoid arthritis, avascular necrosis, chondrolysis, posttraumatic arthritis, and instability, and these have been reported to have a less predictable outcome [10]. The combination of younger age at implantation, increased activity level, and more challenging pathology leads to less predictable outcomes and negatively impacts long-term survivorship [9]. This has led surgeons to consider other glenoid-preserving procedures as an alternative to aTSA, because the glenoid component is typically considered to be the “weak link” in shoulder arthroplasty.

Wear of the polyethylene glenoid component with subsequent loosening has been considered a relative contraindication to performing TSA in young patients. For this reason, hemiarthroplasty (HA) has been commonly used as an alternative in this population. There are concerns over the progression of glenoid wear causing pain and poor long-term outcomes [11]. An important consideration for HA is the pattern of glenoid wear, since studies have shown inferior results for eccentric glenoid wear [12]. To address this issue, Matsen and colleagues described their “ream and run” procedure, which recreates a concentric glenoid for humeral articulation and stimulates fibrocartilage growth [13].

When comparing aTSA to HA, studies have not demonstrated a higher failure rate for aTSA in patients under aged 50 years of age [14–16]. A recent clinical study of patients under 60 years of age with primary glenohumeral osteoarthritis who underwent aTSA showed that the procedure resulted in significantly better functional and subjective outcomes with no significant difference in survivorship compared with patients treated with HA [17]. The survivorship of aTSA was 95% free of revision at 5 years, 83% at 10 years, 68% at 15 years, and 60% at 20 years of follow-up. From a health economics point of view, aTSA was more cost-effective than HA, including for patients under 50 years of age [18]. Despite the additional initial cost of aTSA implants, health-care utilization postoperatively was greater for HA than for TSA and utility scores for hemiarthroplasty were inferior. Furthermore, regarding the return to sport, a meta-analysis by Liu et al. [19] reported a higher return-to-sport rate in patients with aTSA (92.6%) compared with HA (71%).

It is believed that conversion of HA to aTSA has become much easier with the advent of modular convertible TSA systems. However, these revision procedures are not analogous to primary aTSA and can be technically challenging. During these revision procedures, the surgeon is often confronted with asymmetrical glenoid erosion as well as a scarred and contracted soft tissue envelope (including the subscapularis tendon) that increases the surgical complexity and the risk of complications. In a series of 16 patients undergoing revision of a HA to an aTSA, 31% had postoperative complications that required further revision [20]; this included glenoid loosening, instability and sepsis. The authors concluded that the results of revising a failed HA to an aTSA are inferior to those of primary aTSA.

Other glenoid-preserving options involve biologic glenoid resurfacing procedures with a number of graft sources to limit glenoid erosion and worsening arthrosis [21, 22]. The results of these procedures have been mixed, with some studies showing extremely high failure rates [23].

**Bone preservation in aTSA**

**Humerus**

The advent of the fourth-generation convertible platform shoulder systems came with the hope of preserving bone stock at the time of revision surgery with a less complicated revision procedure that did not require component extraction [24]. This concept is especially appealing for young patients with aTSA who may require revision surgery due to potential failure of the rotator cuff or the glenoid component. These convertible systems were designed to enable retention of the humeral stem and easier conversion to an rTSA [25–28]. It has become clear that conversion is not that simple. Studies show that when converting an aTSA to an rTSA, 62.5% of the humeral stems need to be revised [27–31]. There are a number of reasons why the humeral stem cannot simply be retained and converted to an rTSA, including extensive soft tissue contractures, malposition or inappropriate version of the humeral stem, or impingement leading to impaired range of motion. Hence, the humeral component often requires extraction and results in more complex revision surgery. It must be appreciated that the biomechanics of an aTSA is very different to an rTSA, and therefore it is difficult to imagine how a convertible platform can achieve the goal of providing ideal aTSA biomechanics and then ideal rTSA biomechanics without compromise after conversion. Although convertibility is a nice concept, the unique biomechanics of aTSA versus rTSA may not allow for a successful coexistence without compromising the biomechanics of one or the other.

For many years, the standard humeral prosthesis followed the example of a hip replacement with a long stem extending down the intramedullary canal [32]. This created problems when trying to replace the correct anatomy of the proximal humerus. Numerous innovative designs were devised to try to deal with this problem, with variable geometry of both the proximal portion of the humeral prosthesis and the humeral head. Reproduction of the true proximal humeral anatomy when gross deformity is present, such as a result of fracture malunion, is often insurmountable with a stemmed prosthesis and this has led to the development of the resurfacing replacement prosthesis, of which the Copeland prosthesis was probably the best known [33]. But the technique of reaming of the humeral head with a surface replacement can result in overstuffing of the shoulder joint. Furthermore, as the humeral head was not removed, access to
the glenoid, particularly in a stiff shoulder, was often quite difficult. An alternative to a long stem and a resurfacing replacement is a prosthesis with a short stem that does not rely on the intramedullary canal. This has been termed either a “stemless” prosthesis or “short-stem prosthesis.” The position of the short stem and consequently the humeral head prosthesis is, therefore, not related in any way to the anatomy of the humeral medullary canal. Theoretically, therefore, the humeral head replacement can more reliably replicate native humeral head anatomy.

The introduction of stemless aTSA in 2004 [34] has been a significant advance in shoulder arthroplasty, avoiding stem-related problems such as intraoperative fracture, loosening, and stress shielding [35–37]. This is especially relevant in the younger population. There are now multiple designs with different fixation methods and implantation techniques. The advantages of stemless implants are multiple. Firstly, correct anatomical positioning of the prosthetic humeral head is easier, regardless of offset. It has been shown that precise reproduction of the center of rotation of the proximal humerus is crucial to avoid overstuffing and increase longevity of the implant [38, 39]. This is especially useful in cases of proximal humeral deformity due to malunion [40]. Secondly, if revision is necessary, the minimally intrusive metaphyseal component is easier to extract resulting in preservation of the bone stock of the proximal humerus [41]. Thirdly, the incidence of intraoperative humeral fractures is lower than with the stemmed component, at a rate of 0.5% [42] compared to 2.3% [43]. Finally, due to the absence of intramedullary preparation and of the implantation of a stem, there may be shorter operating times [44] and less blood loss [45]. Although there are no long-term results with these implants, their clinical outcome and overall complication and revision rates are as good as stemmed designs in both short- and medium-term follow-ups [45–48]. Radiologic changes (radiolucencies, osteolysis, and stress shielding) with stemless humeral components are less frequent than in the stemmed implants [49–51], owing to the closer resemblance to native anatomy and more physiological distribution of forces. However, canal-sparing devices also have disadvantages. They may be inappropriate for patients with poor bone quality, metaphyseal cysts, osteopenia, osteoporosis, or other types of metabolic bone disease due to inadequate fixation [52]. Unfortunately, there is no objective pre- or intraoperative measure of metaphyseal bone quality to assist in determining the suitability of the patient for a canal-sparing humeral implant.

**Glenoid**

Asymmetric glenoid bone defects, such as the retroverted Walch type B2/B3 glenoid, pose a challenging problem in young patients. The surgical options available to manage retroverted glenoids include using an aTSA with eccentric reaming, structural glenoid bone grafting, or an augmented glenoid component [53]. With posterior glenoid wear of up to 15° of retroversion, eccentric anterior reaming has traditionally been used to recenter the humeral head and avoid eccentric load on the glenoid component and subsequent loosening [54, 55]. In the presence of severe retroversion (>15°) or significant glenoid bone loss, bone grafting may be required at the time of aTSA. Sabesan et al. reported substantial clinical and radiographic mid-term improvement of aTSA with an all-polyethylene glenoid component and autologous bone graft obtained from the humeral head [56]. A systematic review showed comparable revision rates and improvement in pain compared to augmented glenoid components and rTSA [57]. However, the use of a bone graft is complicated by the need for stable fixation of the bone graft prior to implantation of an all-polyethylene glenoid or the use of a metal-backed glenoid, which has demonstrated high rates of early failure [58].

A more recent trend in treating glenoid deformity with bone loss is the use of an augmented polyethylene glenoid component that allows for correction of retroversion, while avoiding joint-line medialization preserving glenoid bone with minimal reaming [59]. Biomechanical and clinical studies suggest that posterior augmented glenoid components may be valuable for specific indications (15–25° of retroversion and significant posterior subluxation, as well as eccentric wear), improving the surgeon’s ability to correct excessive glenoid retroversion and posterior humeral head subluxation. All-polyethylene augmented implants are showing promising short-term results [60, 61]. There is, however, substantial variation in the quantity of bone removed with various augmented implant designs (e.g., half/full width wedges or step cuts), with the posterior-wedge design removing the least amount of glenoid bone to enable appropriate seating [62]. Finally, another recent strategy is the use of a porous metal 3D printed augment that matches the patient’s deformity with cementation of a traditional polyethylene glenoid component onto the 3D printed augment. Sandow et al. [63] have shown, in a series of 49 patients with B2 and C glenoids, good fixation and recentering of the humeral head in the mid-term results with no implant failures.

It is important that surgeons understand the position, orientation, and nature of the bone deformity in the Walch B2 glenoids when considering the appropriate management strategy. The orientation of B2 erosions is directed toward the posteroinferior quadrant of the glenoid (Fig. 1). Surgeons should be aware of this orientation, especially if considering bone grafting or commercially available vertically oriented augmented glenoid components [64]. Knowles et al. also showed that asymmetric (B2) erosion patterns have potentially important regional variations in bone density and porosity, with the densest and least porous bone found posterosuperiorly or in the neoglenoid region. Therefore, reaming and subsequent bone removal should be thoughtfully considered and templated, as excess bone removal may reduce the quality of the remaining glenoid bone, leading to potentially compromised implant stability.

**Materials**

The glenoid component remains the weak link in shoulder arthroplasty with various modes of glenoid component failure still problematic [65]. Wear of the polyethylene glenoid component and subsequent particle-induced osteolysis is one of these modes of failure similar to what has been
when considering shoulder arthroplasty, consideration that must be addressed loading [75]. Edge-loading is a specific congruent with resultant relative point-

The kinematics of a shoulder arthroplasty are more similar to a knee than a hip in that the articulation is non-

cross-linked polyethylene arthroplasty components have been introduced in an attempt to reduce wear. Concerns over the reduced mechanical properties seen in highly cross-linked polyethylene (XPE) after remelting or heat annealing, however, have led to the development of alternative methods to stabilize free radicals [68]. In vitro studies have demonstrated that adding vitamin E to polyethylene to act as an antioxidant can significantly stabilize free radicals that exist as a by-product of irradiation [69, 70]. Biomechanical studies have shown improved wear compared with polyethylene without vitamin E, especially after accelerated aging [71–73]. Although the introduction of XPE (with or without vitamin E supplementation) in hip and knee arthroplasty has been well documented, there is little comparable literature regarding the shoulder [74]. It has been shown that shoulder arthroplasty behaves very differently to the hip in terms of wear patterns and particle generation [75].

The kinematics of a shoulder arthroplasty are more similar to a knee than a hip in that the articulation is non-

observed in hip and knee arthroplasty [65–67].

Cross-linked polyethylene arthroplasty components have been introduced in an attempt to reduce wear. Concerns over the reduced mechanical properties seen in highly cross-linked polyethylene (XPE) after remelting or heat annealing, however, have led to the development of alternative methods to stabilize free radicals [68]. In vitro studies have demonstrated that adding vitamin E to polyethylene to act as an antioxidant can significantly stabilize free radicals that exist as a by-product of irradiation [69, 70]. Biomechanical studies have shown improved wear compared with polyethylene without vitamin E, especially after accelerated aging [71–73]. Although the introduction of XPE (with or without vitamin E supplementation) in hip and knee arthroplasty has been well documented, there is little comparable literature regarding the shoulder [74]. It has been shown that shoulder arthroplasty behaves very differently to the hip in terms of wear patterns and particle generation [75].

The kinematics of a shoulder arthroplasty are more similar to a knee than a hip in that the articulation is non-

The benefits of arthroplasty for the shoulder have been well documented and there are a number of different procedures which can be performed. However, the long-term follow-up of patients undergoing shoulder arthroplasty is limited in comparison to the hip and knee literature [93] and even more scarce for the younger population. One of the first long-term studies with a minimum of 15 years of follow-up was published by Sperling et al. in 2004 [15], which showed that there is marked long-term pain relief and improvement in motion with aTSA. The survival rate for aTSA was as high as 97% at 10 years and 84% at 20 years. However, radiographic analysis revealed concerning changes of humeral and glenoid periprosthetic lucencies, probably due to polyethylene-induced osteolysis. The authors also reported up to 48% unsatisfactory patient ratings mostly due to motion restriction. Subsequently, the authors reviewed the same cohort of pa-
tients beyond a minimum of 20 years of follow-up [93]. The implant survivorship was still above 75% and the gains in range of motion have been maintained. However, the unsatisfactory ratings continue to rise to 60%, mostly due to reoperation or restricted motion (<90% of abduction or <20% external rotation). They concluded that surgeons should remain cautious in performing shoulder arthroplasty in the young patient. Recently, a multicenter retrospective study of 273 shoulders reported the results of aTSA for primary osteoarthritis in under-50-year-olds [94]. The patients were followed up at a mean of 95 months and had a substantial improvement of 34 points in the Constant score and 43% in the subjective shoulder value (SSV). There were seven implant exchanges (9%): two secondary cuff tears, four cases of polyethylene glenoid loosening, and one case of polyethylene wear on a metal-back glenoid. There is a scarcity of long-term studies of aTSA in patients younger than 50 years, and the ones available are heterogeneous, reporting a mixture of alternative procedures to aTSA or a mixture of TSA components and techniques. Better designed homogeneous studies with modern implants are necessary.

The risk of glenoid-sided failure has been the main deterrent for young, active patients undergoing TSA [95]. The choice of glenoid component is critical for the longevity of aTSA in this age group. Gauci et al. [58] found that the rates of survival for all-polyethylene and metal-backed components were 70% and 22%, respectively, at 12 years postoperatively. In the New Zealand Joint Registry, uncemented metal-backed glenoids had double the revision rate compared to cemented all-polyethylene in primary aTSA at the 5-year follow-up [96]. With all-polyethylene glenoids, the fixation design also plays a crucial role in longevity. Denard et al. [97] reported a 2% revision rate for glenoid loosening at 5 years and 38% at 10 years with keeled glenoid component in patients younger than 55 years. Despite the debate between
implants of earlier designs (outcomes surpassing the results of aTSA appear to have a positive impact on patient new designs and materials of aTSA approach in use [1]). The main reason for that change is the promising results of stemless implants at mid-term follow-up. The AOANJRR reported a revision rate of 2.6% in 2012, in contrast to the continuing decline in use of stemmed aTSA [1]. The main reason for that change is the promising results of stemless implants at mid-term follow-up. The AOANJRR reported a revision rate of 2.6% in 2012, in contrast to the continuing decline in use of stemmed aTSA [1]. The main reason for that change is the promising results of stemless implants at mid-term follow-up. The AOANJRR reported a revision rate of 2.6% in 2012, in contrast to the continuing decline in use of stemmed aTSA [1]. The main reason for that change is the promising results of stemless implants at mid-term follow-up. The AOANJRR reported a revision rate of 2.6% in 2012, in contrast to the continuing decline in use of stemmed aTSA [1].

Declarations
Conflict of interest. S. Raniga has received research grants from Mathys and Medacta and serves as a medical advisor to Mathys. D.J. Boker has received research grants from Smith & Nephew and serves as a medical advisor to Smith and Nephew and Mathys. A. Arenas-Miquelez declares that he has no competing interests.

For this article no studies with human participants or animals were performed by any of the authors. All studies mentioned were in accordance with the ethical standards indicated in each case.

Open Access. This article is licensed under a Creative Commons Attribution 4.0 International License, which permits use, sharing, adaptation, distribution and reproduction in any medium or format, as long as you give appropriate credit to the original author(s) and the source, provide a link to the Creative Commons license, and indicate if changes were made. The images in the article’s Creative Commons license, unless indicated otherwise in a credit line to the material, if material is not included in the article’s Creative Commons license and your intended use is not permitted by statutory regulation or exceeds the permitted use, you will need to obtain permission directly from the copyright holder. To view a copy of this license, visit http://creativecommons.org/licenses/by/4.0/.

References
1. The Australian Orthopaedic Association National Joint Replacement Registry (2021) Annual report 2021. Australian Orthopaedic Association, Adelaide, Australia
2. Bell SN, Coghlan JA (2014) Short stem shoulder replacement. J Shoulder Elbow Surg 88(3):72–75
3. Torchia ME, Cofield RH, Settgergren CR (1997) Total shoulder arthroplasty with the Neer prosthesis: long-term results. J Shoulder Elbow Surg 6(6):495–505
4. Walch G et al (2011) Results of a convex-back cemented keeled glenoid component in primary osteoarthritis: multicenter study with a follow-up greater than 5 years. J Shoulder Elbow Surg 20(3):385–394
5. Dunn JC et al (2015) Predictors of length of stay after elective total shoulder arthroplasty in the United States. J Shoulder Elbow Surg 24(5):754–759
6. Bohsali KI, Wirth MA, Rockwood CA Jr. (2006) Complications of total shoulder arthroplasty. JBone Joint Surg Am 88(10):2279–2292
7. Tripolt JI et al (2015) Anatomic and reverse total shoulder arthroplasty in patients older than 80 years. Orthopedics 38(10):e904–e10
8. Roberson TA et al (2017) Outcomes of total shoulder arthroplasty in patients younger than 65 years: a systematic review. J Shoulder Elbow Surg 26(7):1298–1306
9. Brolin TJ, Thakar OV, Abboud JA (2018) Outcomes after shoulder replacement surgery in the young patient: how do they do and how long can we expect them to last? Clin Sports Med 37(4):593–607
10. Saltzman MD et al (2010) Comparison of patients undergoing primary shoulder arthroplasty before and after the age of fifty. J Bone Joint Surg Am 92(1):42–47
11. Levine WN et al (2012) Long-term follow-up of shoulder hemiarthroplasty for glenohumeral osteoarthritis. J Bone Joint Surg Am 94(2):164
12. Iannotti JP, Norris TR (2003) Influence of preoperative factors on outcome of shoulder arthroplasty for glenohumeral osteoarthritis. J Bone Joint Surg Am 85(2):251–258
13. Matsen FA 3rd, Bicknell RT, Lippitt SB (2007) Shoulder arthroplasty: the socket perspective. J Shoulder Elbow Surg 16(5):S241–S247
14. Burroughs PL et al (2003) Shoulder arthroplasty in the young patient. J Arthroplasty 18(6):792–798
15. Speeling JW (2004) Minimum fifteen-year follow-up of Neer hemiarthroplasty and total shoulder arthroplasty in patients aged fifty years or younger. J Shoulder Elbow Surg 13(6):604–613
16. Speeling JW, Cofield RH (1998) Revision total shoulder arthroplasty for the treatment of glenoid arthrosis. J Bone Joint Surg Am 80(6):860–867
17. Neyton L et al (2019) Mid-to-long-term follow-up of shoulder arthroplasty for primary glenohumeral osteoarthritis in patients aged 60 or under. J Shoulder Elbow Surg 28(9):1666–1673
18. Lapner P et al (2021) Total shoulder arthroplasty is cost-effective compared with hemiarthroplasty: a real-world economic evaluation. J Bone Joint Surg Am 103(16):1499–1509
19. Liu J et al (2018) Return to sport after shoulder arthroplasty: a systematic review and meta-analysis. Knee Surg Sports Traumatol Arthrosc 26(1):100–112
20. Carroll RM et al (2004) Conversion of painful hemiarthroplasty to total shoulder arthroplasty: long-term results. J Shoulder Elbow Surg 13(6):599–603
21. Burtche VA Jr, Krishnan SG, Lin KC (2007) Biologic resurfacing of the arthritic glenohumeral joint: historical review and current applications. J Shoulder Elbow Surg 16(5):S248–S253
22. Wirth MA (2009) Humeral head arthroplasty and meniscal allograft resurfacing of the glenoid. J Bone Joint Surg Am 91(5):1109–1119
23. Strauss EZ et al (2014) The high failure rate of biologic resurfacing of the glenoid in young patients with glenohumeral arthritis. J Shoulder Elbow Surg 23(3):409–419
24. Werner BC, Dines JS, Dines DM (2016) Platform systems in shoulder arthroplasty. Curr Rev Musculoskelet Med 9(1):49–53
25. Castagna A et al (2013) Conversion of shoulder arthroplasty to reverse implants: clinical and

Funding. Open Access funding enabled and organized by CAUL and its Member Institutions

Corresponding address
Antonio Arenas-Miquelez, M.D., FEBOT
MQ Health Translational Shoulder Research Program, Faculty of Medicine & Health Sciences, Macquarie University Balalacla Rd, Macquarie Park, 2109 Sydney, NSW, Australia antarenas1987@gmail.com

Practical conclusion
– Anatomic total shoulder arthroplasty has evolved over the past four decades to become a reliable procedure with predictable and satisfactory clinical outcomes and longevity.
– In young patients under the age of 50 years, it is important to carefully consider using an implant that reliably restores ideal biomechanics with bone preservation on both the humeral and glenoid sides.

The use of novel materials such as vitamin E-stabilized highly cross-linked polyethylene and ceramic has the potential of reducing wear and increasing longevity.
Anatomische totale Schulterarthroplastik bei Patienten unter 50 und bei Patienten über 80 Jahren. Teil 1

Die anatomische totale Schulterarthroplastik ist weit verbreitet im Einsatz, um eine definitive chirurgische Versorgung eines Glenohumeralgelenks mit Arthrose im Endstadium zu erzielen, und geht mit guten klinischen Ergebnissen einher. Bei Patienten unter 50 Jahren, bei denen alle nichtoperativen Behandlungsmöglichkeiten erschöpft sind, und bei Patienten über 80 Jahren mit einer intakten Rotatorenmanschette ist die anatomische totale Schulterarthroplastik von Bedeutung. Patienten unter 50 Jahren haben größere Ansprüche an ihre rekonstruierten Schultern, was zu Bedenken hinsichtlich des Überlebens von Implantaten und insbesondere des Versagens der glenoidalen Komponente führt. In der Literatur sind Daten zum Langzeitüberleben von anatomischen totalen Schulterarthroplastiken bei Patienten unter 50 Jahren nur begrenzt verfügbar. Moderne knochenerhaltende Designansätze mit Verwendung neuartiger Materialien könnten zu besseren Ergebnissen und besserem Implantatüberleben beitragen. Die Erzielung vergleichbarer funktionaler Ergebnisse bei Patienten über 80 Jahren bleibt weiterhin eine Herausforderung mit Bedenken in Bezug auf ein Versagen der Rotatorenmanschette. Jedoch geht bei entsprechend ausgewählten Patienten über 80 Jahren eine anatomische totale Schulterarthroplastik mit einer besseren Schmerzlinderung und Funktion einher als eine reverse totale Schulterarthroplastik.

Schlüsselwörter
Totaler Schultergelenkersatz · Langzeitüberleben · Schulterprothese · Glenoidkomponente · Glenohumeralgelenk