

# À la Carte

The discovery of a new dish does more for the happiness of the human race than the discovery of a star.

—Jean Anthelme Brillat-Savarin;  
*The Physiology of Taste: Or,  
Meditations on Transcendental Gastronomy*

Surgeons lucky enough to have attended the 10th Biennial Congress of ISAKOS, the International Society of Arthroscopy, Knee Surgery and Orthopaedic Sports Medicine, in Lyon this year were treated to an experience that they will not soon forget. Readers who participated in the June event will understand what I mean. Personally, I know that years from now I will still begin to salivate like a Pavlovian hound whenever I recall the *Poêlée de gros escargots, girolles et chanterelles* that drew me back to Bistrot Gustave, or the *Foie gras de canard poêlé* that massaged my tastebuds at Le Gourmet de Seze. Perhaps you preferred the *Oeufs en meurettes*, the *Cabillaud à l'aoli*, the *Quenelles lyonnaises*, or the *Rognons de veau rotis* from your favorite *bistrot, bouchon, or restaurant*. There was a real danger that the scientific knowledge gained each day from the many outstanding presentations might be erased by the nightly food coma that inevitably followed.

The exalted position of Lyon in the gastronomic firmament is legendary, but the city is renowned for many other things, including silk, Roman amphitheaters, the French Resistance, and knee surgery<sup>4</sup>; the latter item making it a particularly fitting locale for the ISAKOS congress. Names like Trillat, DeJour, Imbert, Bousquet, Chambat, Moyen, Walch, and Neyret immediately come to mind. My last visit to Lyon was as an AOSSM-ESSKA traveling fellow in 1986, when I had the good fortune to meet most of these luminaries and watch them practice their art.

Given the importance of gastronomy in the Lyonnais consciousness, it is not surprising that an epicurean analogy should find its way into the vocabulary of knee surgery. French restaurants typically offer their patrons several options for composing their meal. Often a *plat du jour* is available: a single featured dish of the day offered at a very attractive price. For a bit more variety, one may choose *le menu*, a list of dishes at a set price with a limited number of choices for the appetizer, main course, and dessert. The different meanings of the word *menu* in

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English and French have no doubt caused confusion for legions of Anglophones. What we English speakers call “the menu” is known in France as *la carte*. If a diner wants to have the most flexibility to customize the gourmet experience, he or she will probably decide to select dishes individually from all those offered, or dine *à la carte*. In a similar vein, the *à la carte* concept is often associated with patellofemoral surgery, where it signifies selecting the components of the surgical procedure from the full array of available options according to the anatomic characteristics of the individual patient.<sup>4</sup>

In this issue of *The American Journal of Sports Medicine*, Tompkins and Arendt<sup>18</sup> systematically review the literature on reconstruction of the medial patellofemoral ligament (MPFL) for patellar instability. In recent years, MPFL reconstruction has become an increasingly common operation, perhaps achieving the status of the standard *plat du jour* treatment for routine cases of recurrent patellar instability. Of course, just as there are many ways to braise a veal kidney, numerous different variations on MPFL reconstruction are reported, with each surgical *chef* featuring his or her own favorite technique. MPFL reconstruction is not without complications, however, including patellar fracture, stiffness, and recurrent instability.<sup>12,13</sup>

While MPFL insufficiency is certainly an important factor in the pathogenesis of patellar instability, there are many other anatomic and physiologic elements of potential relevance to the condition.<sup>15,18</sup> Tompkins and Arendt<sup>18</sup> emphasize the importance of reporting a complete list of these elements, such as basic patient demographics; historical details, including mechanism of injury, baseline activity level, and the particulars of prior rehabilitation efforts; physical examination findings, including knee alignment, lateral patellar translation and apprehension, and systemic laxity; and anatomic features, including patellar height, tibial tubercle position, and trochlear dysplasia, as detected by preoperative imaging.

The authors' review showed that reporting of demographics, historical details, and physical examination findings was quite spotty in the papers they examined. Anatomic elements detectable by imaging were better served, with patellar height reported in 75% of the studies, trochlear dysplasia in 83%, and tibial tubercle alignment in 83% of the studies that utilized computed tomography (CT) or magnetic resonance imaging (MRI). Unfortunately, the use of a variety of classification systems for patellar height and trochlear dysplasia made it difficult to compare these findings across studies.

More consistent reporting of all potentially relevant factors will not only facilitate a thorough comparison of the results of various surgical procedures for patellar instability, but also permit a more fruitful analysis of surgical failures of isolated MPFL reconstruction, ultimately informing surgeons when additional procedures such as

trochleoplasty or tibial tubercle transfer should be selected *à la carte* to increase the chances of a successful outcome. In fact, Tompkins and Arendt<sup>18</sup> caution that the high success rate reported for isolated MPFL reconstruction must be viewed with the knowledge that two-thirds of the studies surveyed specifically excluded patients with the stigmata of high-grade trochlear dysplasia, patella alta, abnormal Q angle, or elevated tibial tubercle–trochlear groove (TT-TG) distance. This may indeed reflect appropriate patient selection, but should be duly noted lest it be assumed that isolated MPFL reconstruction can be expected to produce the same results in more complex cases.

Whereas 8 of the papers they reviewed did include a more heterogeneous population, Tompkins and Arendt<sup>18</sup> noted that only 2 of these reported the outcome in relation to preoperative variables.<sup>10,21</sup> Several groups of authors have specifically detected an association between trochlear dysplasia and poorer outcomes or outright failure following MPFL reconstruction.<sup>8,10,21</sup> Although they found a high rate of success of MPFL reconstruction in children and adolescents, Nelitz and colleagues<sup>10</sup> noted that 2 patients with high-grade dysplasia demonstrated a persistently positive apprehension test. Hopper et al<sup>8</sup> reported that only 9.3% of their patients with mild trochlear dysplasia developed recurrent dislocation postoperatively, compared with all 7 of their patients with severe dysplasia. Similarly, Wagner et al<sup>21</sup> described a negative relationship between the degree of trochlear dysplasia and subjective outcomes. In contrast with these studies, the earlier report of Steiner et al<sup>16</sup> did not find a relationship between the degree of dysplasia and outcome of MPFL reconstruction, although the number of patients with severe dysplasia in their cohort was not completely clear.

Reshaping the femoral trochlea is not a minor surgical procedure, and these studies suggest that it may only be needed when more severe degrees of dysplasia are present. Indeed, in reporting the results of the “Lyon technique” of trochleoplasty, Dejour and colleagues<sup>3</sup> noted that, even at a center known for this operation, they only performed 24 cases between 1993 and 2006. In that series, the authors restricted their use of the operation to patients who had failed simpler surgical treatments. Going forward, they noted that it would be desirable to be able to identify these patients before an unsuccessful treatment is initiated. “The satisfying results that are recorded in these patients after trochleoplasty probably show the need for the early recognition of a subgroup of patients with trochlear dysplasia in whom the benign neglect of dysplasia and the application of conventional surgery for the treatment of patellar dislocation is ill-fated.”<sup>3(p438)</sup>

One roadblock to achieving this goal is the plethora of classification systems for trochlear dysplasia and the difficulty of using them reproducibly among different observers. For example, Tompkins and Arendt<sup>18</sup> noted 4 different classification systems among the 24 studies they reviewed. Adding to the confusion is the existence of 2 related but distinct schemes developed by 2 generations of Dejours.<sup>5,9</sup> The one more commonly used today, by David Dejour,<sup>9</sup> separates dysplastic trochleas into 4

categories, labeled A, B, C, and D, according to their appearance on lateral radiographs or axial MRI. While these 4 classes are in theory quite distinct, it has proven difficult in practice for different observers to distinguish them reliably.<sup>9,11</sup> Lippacher et al<sup>9</sup> reported that simplifying the system into 2 groups, with type A considered low-grade and types B, C, and D bundled together as high-grade, produced substantially better intra- and interobserver agreement. Other studies have clustered the categories differently, placing types B and D, both distinguished by the presence of a supratrochlear spur, into 1 basket, and A and C into another.<sup>3,7</sup> Fucentese et al<sup>7</sup> reported better results after trochleoplasty in patients with types B and D trochleas compared to those with types A and C, and all patients in Dejour’s 2013 report of trochleoplasty following unsuccessful patellofemoral surgery had types B and D trochleas.<sup>3</sup> Using yet another permutation, Hopper et al<sup>8</sup> grouped types A and B under the heading of mild dysplasia and types C and D as severe when they analyzed their results for MPFL reconstruction.

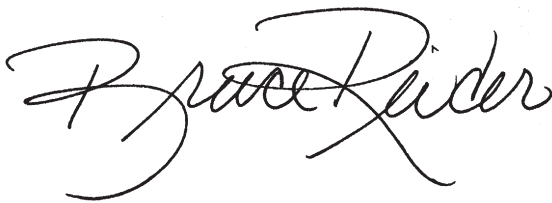
To complement clinical research and potentially guide surgeons in their selection of appropriate procedures *à la carte*, researchers have performed a number of laboratory studies investigating the effects of these choices on the biomechanics of the patellofemoral joint in cadaveric knees. It is, however, rather difficult to accumulate a supply of dysplastic knees for study, so these investigations have generally been carried out in knees with ostensibly normal anatomy, thus reducing the applicability of the findings to the clinical situation. Two recent studies published in *AJSM* have used different methods to moderate this limitation.

In this issue, Stephen et al<sup>17</sup> report “The Ability of Medial Patellofemoral Ligament Reconstruction to Correct Patellar Kinematics and Contact Mechanics in the Presence of a Lateralized Tibial Tubercle.” In this study, the authors simulated knees with an elevated TT-TG distance by transferring the tibial tubercles of their specimens laterally in 5-mm increments. They found that isolated MPFL reconstruction could restore normal contact pressures and tracking patterns when the resultant TT-TG was 15 mm or less, but not when it reached 20 or 25 mm. These findings tend to reinforce the cut-off value of 20 mm that has frequently been used to define an elevated TT-TG distance.<sup>2,14,15</sup>

Another recent *AJSM* study utilized the technological marvel of 3-dimensional (3D) printing to fit normal knees with custom-made dysplastic trochlear implants in order to measure “The Effect of Trochlear Dysplasia on Patellofemoral Biomechanics.”<sup>19</sup> Starting with 3D CT images of dysplastic trochleas from actual patients, they created these implants from biphasic materials chosen to mimic the characteristics of human bone and cartilage,<sup>20</sup> then measured the effect of the resulting “dysplastic” anatomy on patellofemoral kinematics, contact area and pressure, and stability during simulated activities. In support of some of the previously mentioned clinical studies, they found that the knees with Dejour types B and D trochleas showed the largest deviations in patellofemoral biomechanics.

Of course, caution must always be exercised when extrapolating the results of any laboratory model to the clinical situation. In actual patients, the patellofemoral joint develops as an integrated organ, so simulating dysplastic trochleas or lateralized tibial tubercles in isolation fails to reproduce changes in the patella and soft tissue structures that would probably exist concomitantly. Nevertheless, the more that laboratory models can be made to simulate abnormal clinical anatomy, the more relevant they become; these clever studies represent a step in the right direction and seem to provide support to previously derived clinical guidelines for *à la carte* procedure selection.

The concept of *à la carte* surgery is not just relevant to the patellofemoral joint.<sup>1,6</sup> Customizing an operation to fit the specific developmental or traumatic abnormalities present is just good surgical practice. On the other hand, the human organism can be incredibly forgiving, and trying to correct every slight abnormality can be overly meddlesome and increase the risk of complication with little or no associated benefit. Well-designed research can help us discern when more extensive procedures are indicated. During my sojourn in Lyon, I often found that the *plat du jour* or *le menu* satisfied both my hunger and sense of gastronomic adventure while leaving many welcome euros in my wallet. Occasionally, however, I developed a powerful epicurean hankering for something like *Tête de veau cuite au court-bouillon, sauce ravigote* that could only be satisfied by ordering *à la carte*, regardless of the cost.



Bruce Reider, MD  
Chicago, Illinois

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