NATIONAL INSTITUTE FOR HEALTH AND CARE EXCELLENCE

Final draft guidance

Deucravacitinib for treating moderate to severe plaque psoriasis

Recommendations

1.1 Deucravacitinib is recommended as an option for treating moderate to severe plaque psoriasis in adults, only if:

- the Psoriasis Area and Severity Index (PASI) is 10 or more and the Dermatology Life Quality Index (DLQI) is more than 10
- the condition has not responded to other systemic treatments, including ciclosporin, methotrexate and phototherapy, or these options are contraindicated or not tolerated
- the company provides deucravacitinib according to the commercial arrangement (see section 2).

1.2 Consider stopping deucravacitinib between 16 weeks and 24 weeks if there has not been at least a 50% reduction in the PASI score (PASI 50) from when treatment started.

1.3 Consider stopping deucravacitinib at 24 weeks if the psoriasis has not responded adequately. An adequate response is defined as:

- a 75% reduction in the PASI score (PASI 75) from when treatment started or
- a 50% reduction in the PASI score (PASI 50) and a 5-point reduction in DLQI from when treatment started.

1.4 If people with the condition and their clinicians consider deucravacitinib to be one of a range of suitable treatments (see section 3.18), after discussing the advantages and disadvantages of all the options, use the

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least expensive. Take account of administration costs, dosage, price per dose and commercial arrangements.

1.5 Take into account how skin colour could affect the PASI score and make any adjustments needed.

1.6 Take into account any physical, sensory or learning disabilities, or communication difficulties that could affect the responses to the DLQI and make any adjustments needed.

1.7 These recommendations are not intended to affect treatment with deucravacitinib that was started in the NHS before this guidance was published. People having treatment outside these recommendations may continue without change to the funding arrangements in place for them before this guidance was published, until they and their NHS clinician consider it appropriate to stop.

Why the committee made these recommendations

Treatment for moderate to severe plaque psoriasis that has not responded to conventional systemic non-biological treatments or phototherapy includes apremilast, dimethyl fumarate and systemic biological treatments. Deucravacitinib is an alternative to apremilast, dimethyl fumarate and systemic biological treatments.

Clinical trial evidence shows that deucravacitinib improves symptoms of plaque psoriasis compared with placebo and apremilast. Deucravacitinib was indirectly compared with apremilast, dimethyl fumarate and several systemic biological treatments. The indirect comparison suggests it improves symptoms better than apremilast and dimethyl fumarate, and works as well as some biological treatments but not as well as others.

The cost-effectiveness estimates for deucravacitinib compared with apremilast, dimethyl fumarate and most biological treatments are within the range that NICE normally considers an acceptable use of NHS resources. So, deucravacitinib is recommended.

2 Information about deucravacitinib

Marketing authorisation indication

2.1 Deucravacitinib is indicated for 'the treatment of moderate to severe plaque psoriasis in adults who are candidates for systemic therapy'

Dosage in the marketing authorisation

2.2 The dosage schedule is available in the summary of product characteristics for deucravacitinib.

Price

2.3 The list price of deucravacitinib is £690 per 28 tablet pack (excluding VAT; company submission).

2.4 The company has a commercial arrangement (simple discount patient access scheme). This makes deucravacitinib available to the NHS with a discount. The size of the discount is commercial in confidence. It is the company's responsibility to let relevant NHS organisations know details of the discount.

3 Committee discussion

The evaluation committee considered evidence submitted by Bristol Myers Squibb, a review of this submission by the external assessment group (EAG), and responses from stakeholders. See the committee papers for full details of the evidence.

Plaque psoriasis

Effects on quality of life

3.1 Plaque psoriasis is an inflammation of the skin caused by overactivity of parts of the immune system. Statements from patient groups explained that it can be a distressing and debilitating condition at any level of severity and it is a lifelong condition which can affect all aspects of daily life (physical, psychological, social and financial). The patient experts explained that the physical appearance of the condition can be very

stressful and cause anxiety and that this may affect younger people more. They also explained how a key concern for people with psoriasis is how to manage flare-ups and what to do if treatments stop working. The committee concluded that plaque psoriasis has a significant effect on quality of life and having a range of effective treatments with different mechanisms of action is important to people with psoriasis.

Clinical management

Treatment options

3.2 People with plaque psoriasis may have topical treatments (such as corticosteroids, vitamin D analogues or dithranol) as first-line treatments, followed by phototherapy as second-line treatments. If this does not control the psoriasis, people may have conventional systemic non-biological treatments at third line (such as methotrexate, ciclosporin or acitretin). If the psoriasis does not respond adequately to these treatments, people may move onto a fourth line of treatment which includes apremilast, dimethyl fumarate and systemic biological treatments. Biological treatments include tumour necrosis factor alpha inhibitors (adalimumab, certolizumab pegol, etanercept, infliximab), interleukin-17 inhibitors (bimekizumab, brodalumab, ixekizumab, secukinumab) and interleukin-23 inhibitors (risankizumab, tildrakizumab, guselkumab, ustekinumab). Deucravacitinib is a small molecule, non-biological tyrosine kinase 2 inhibitor that would be used as a fourth-line treatment. Biosimilar versions of some biological treatments are also available. People use these treatments until they stop working, then they will be offered another. The clinical expert explained that in the event of secondary failure (when a treatment initially works then stops working) it is reasonable to try another treatment in the same class. However, in the event of primary failure (when a treatment never works) clinicians would likely move on to a treatment from a different drug class. People are likely to move from 1 fourth-line treatment to another throughout their lifetime. The clinical expert noted that there is a distinction between the biological treatments which are administered subcutaneously and the non-biological

treatments, including deucravacitinib, which are taken orally. They explained that some people might favour oral non-biological treatments because they do not need refrigeration, or because of the burden associated with subcutaneous injection. If all suitable treatment options were used up then people would move to best supportive care (which is managing symptoms using non-systemic treatments such as ointments), however the clinical expert said they expected that relatively few people would reach this point in practice. The committee considered that there are a range of treatment options within the fourth line of treatment. Choice of treatment is individualised and reflects people's preferences and clinical symptoms. So the way treatments are administered is important and is one difference between biological and non-biological treatments. The committee concluded that clinicians and people with psoriasis would value new oral treatment options with novel mechanisms of action.

Comparators

3.3 The company positioned deucravacitinib as an alternative only to apremilast, dimethyl fumarate and systemic biological treatments. These treatments are used fourth line after methotrexate, ciclosporin or acitretin. The positioning was therefore narrower than the marketing authorisation, which covers any adults with moderate to severe plaque psoriasis when systemic treatment is suitable. The clinical expert explained that if deucravacitinib was recommended, it would be used in line with the company's positioning at fourth line. The committee recalled that people with psoriasis may have several fourth-line treatments during their lifetime and questioned where in the order of fourth-line treatments deucravacitinib would be used. The clinical expert noted that it could be used at any point in the order of fourth-line treatments. They also explained that although there is variation in treatment sequences used across the NHS and any other biological treatments could be used first, adalimumab is normally used first unless it is clinically unsuitable. The clinical expert noted that deucravacitinib could be preferred when biological treatments are not suitable. People may also prefer

deucravacitinib because it is an oral treatment that does not have the inconveniences of subcutaneous injections, and uses a novel mechanism of action within the psoriasis treatment pool. The committee considered that deucravacitinib could be used in place of any of the fourth-line biological treatments, but that the comparisons with apremilast and dimethyl fumarate were highly relevant and key for decision making.

Clinical effectiveness

POETYK-PSO trials

3.4 The company submitted clinical effectiveness data from 2 trials, POETYK-PSO-1 and POETYK-PSO-2 and data from a long-term extension of both trials, POETYK-PSO-LTE. These were double-blind randomised controlled trials that included a total of 1,686 people. They compared deucravacitinib (6 mg daily) with placebo up to 16 weeks and with apremilast (30 mg twice daily) up to 24 weeks. The primary outcomes were a 75% reduction in the Psoriasis Area and Severity Index score (PASI 75) and a static Physician Global Assessment (sPGA) score of 0 or 1. Secondary outcomes included the Dermatology Life Quality Index (DLQI) score and adverse events. Deucravacitinib achieved significantly more people with a PASI 75 or sPGA 0 or 1 score than placebo and apremilast at week 16 in both trials. In NHS clinical practice, moderate to severe psoriasis is defined as a PASI score of 10 or more but the POETYK inclusion criteria was for a PASI score of 12 or more. The company explained that there is little clinical difference between a PASI score of 10 and 12. It said that this difference in score, or other differences in eligibility criteria, would likely have a minimal impact on the relative effect sizes of deucravacitinib compared with placebo and apremilast. The clinical expert confirmed that a 2-point difference in PASI score is unlikely to make a difference to patient perception of the condition or affect DLQI score. The committee concluded that the POETYK-PSO-1 and POETYK-PSO-2 trials were generalisable to NHS clinical practice.

Network meta-analysis

Network meta-analysis methodology and results

3.5 The company used 84 trials to do a network meta-analysis (NMA) at 3 timepoints (10 to 16 weeks, 24 to 28 weeks and 44 to 60 weeks). The NMA compared PASI response of deucravacitinib with many comparator treatments, including infliximab. Although infliximab is only recommended for very severe psoriasis, it was included by the company to strengthen the NMA. However, a sensitivity analysis which compared response to deucravacitinib at 24 weeks, tildrakizumab at 28 weeks and all other comparators at the 10 to 16 week timepoint was chosen for the base case. The results of the NMA are confidential and cannot be reported here. The NMA used by the company is consistent with those preferred in previous similar NICE appraisals. The committee agreed that the sensitivity analysis selected for the base case was reasonable because it represented the time points when response would be assessed in clinical practice. It concluded that the NMA was suitable for decision making. The committee noted that in the base case sensitivity analysis, the PASI 75 response rates for deucravacitinib were higher than those for etanercept, apremilast and dimethyl fumarate. But they were either similar or lower for deucravacitinib than for other biological treatments including adalimumab. The committee concluded that deucravacitinib was more effective than non-biological treatments but was similarly effective to or less effective than biological treatments.

Economic model

Company's modelling approach

3.6 The company developed a Markov model which included a sequence of 3 treatment options within the fourth line of active treatment followed by best supportive care (BSC). In clinical practice, the committee understood that most people would have more than 3 treatments at fourth line but agreed that modelling only 3 active treatments was a reasonable simplification and was consistent with previous NICE appraisals. For each active

treatment, people entered the model in the induction state. At the end of the induction period for each treatment, those with a PASI 75 response or above moved to the maintenance phase, while those without a PASI 75 response moved to the induction phase of the next treatment. The maintenance phase health state corresponded to 3 different PASI response thresholds. People moved to the BSC health state if their psoriasis did not respond to the final treatment in the sequence. People could move to the death state from any of the other health states. The committee was aware that the model was similar to past NICE appraisals and agreed it was structurally suitable for decision making.

Treatment sequences in the model

3.7 In the model there were 14 comparators, including non-biological and biological treatments. Deucravacitinib was compared with each of the 14 comparators as the first treatment in a sequence of 4 treatments, followed by secukinumab (an IL-17 inhibitor) as the second treatment, risankizumab (an IL-23 inhibitor) as the third treatment, and then BSC as the final treatment. When secukinumab or risankizumab were already modelled as the comparator for first treatment, ustekinumab replaced them as the second or third treatment in the sequence. The company chose these sequences based on market share and expert advice. The committee questioned whether the sequences used in the model reflect NHS clinical practice. The clinical expert explained that adalimumab (1 of the 14 comparators) would most likely be used as the first treatment at fourth line, with variation in the sequence of treatments used after it. The patient expert agreed that adalimumab would be used first, with IL-17 and IL-23 inhibitors used at second and third position respectively but deucravacitinib could be used at any point in this treatment sequence. The clinical expert agreed that deucravacitinib could also be used in first position, when people wanted to avoid subcutaneous injections of the biological treatments. The committee considered that the evidence presented by the company only showed the cost effectiveness of deucravacitinib when used in the first position in the treatment sequence,

where adalimumab was likely to be the most relevant comparator. When an oral option was the preferred treatment choice, apremilast and dimethyl fumarate would be relevant comparators. Although the committee understood that in clinical practice deucravacitinib may be used later in the treatment sequence, it had not seen any evidence of deucravacitinib modelled in later positions in the treatment sequence (for example after adalimumab). The EAG explained that although the model did not allow deucravacitinib to be positioned as the second treatment in the sequence the results would not be expected to change if this was possible. This is because the outcomes from the first treatment would be equal and there is no evidence of reduced effect in people whose condition has not responded or has stopped responding to their initial fourth-line treatment. The committee concluded that it would have preferred to see evidence of deucravacitinib at alternative places in the treatment sequence but that it was unlikely to impact the cost-effectiveness results.

Resource use

3.8 The DISCOVER study was a non-interventional retrospective longitudinal cohort study collecting data on primary and secondary care use by people with moderate to severe psoriasis from northwest London. The company used this study to inform resource use for costs for people whose psoriasis did not respond and for people who stopped biological treatment and moved into BSC. The EAG noted that the DISCOVER study estimated costs in the 12 months after treatment discontinuation. It considered that it was uncertain if these costs could be extrapolated to the lifetime time horizon of the model. The company said that it would be too complex to explicitly model these costs over the entire model. The EAG acknowledged this difficulty. The company provided a scenario analysis which informed resource use from inflation-adjusted estimates from the Fonia et al. study which had been used to inform resource use in previous psoriasis NICE appraisals. This resulted in slightly higher costs than when the DISCOVER study was used. This was because the DISCOVER study

measured costs before and after stopping a biological treatment, whereas the Fonia study measured costs before and after starting a biological treatment. The company also noted that the difference may be because of changes in the treatment landscape and increased inpatient activity since the Fonia study was done in 2010. The committee noted that the choice of study had little effect on cost effectiveness and concluded that the DISCOVER study was acceptable to model resource cost use.

Non-response and secondary care costs

3.9 In the company's model, costs for people whose psoriasis did not respond were also estimated from the DISCOVER study. The estimates used the costs incurred in the 12 months before discontinuation of biological treatment as a proxy. In the model these secondary care costs were averaged and only applied to people in the BSC health state. This assumes that people on active treatment do not incur any secondary care costs. The EAG considered that although these assumptions are similar to those from previous NICE appraisals there is limited evidence to support them. So the EAG did scenario analyses reducing the costs for BSC and non-response by fixed increments to explore the uncertainty around these parameters. The committee noted that the scenarios around non-response costs did not have a large impact on the results. But when the EAG reduced secondary care costs in the BSC health state it affected the cost-effectiveness results. The committee concluded that the company approach was reasonable given the lack of evidence in this area but that the scenarios showed that the results were highly uncertain.

Best supportive care utility values

3.10 In the company's model, utility values for people in the BSC health state were determined by their baseline level (the level upon entering the model) and not based on the placebo arm PASI response categories from the NMA. In the POETYK-PSO-1 and POETYK-PSO-2 trials there was a PASI improvement in the placebo arm. The company provided clinical opinion based on a consensus of 4 experts, which said that improvements

seen in the placebo arm were likely because of the clinical trial setting and did not represent a natural disease course that would occur in clinical practice. But at the committee meeting both the clinical and patient experts explained that it would be reasonable to assume that for some people, there could be small improvements in their condition without active treatment as part of the natural disease course. For example, if baseline measurements were taken during a flare in disease activity, a later measurement would be expected to show improvement as the flare resolved, even without a disease-modifying treatment effect. The EAG provided 2 scenarios. One scenario applied the placebo PASI response from the NMA to those in the BSC health state, assuming a natural improvement in disease severity. The other scenario applied the placebo PASI response from the NMA to those in the BSC health state who had a PASI 50 response or more, but applied baseline utility to those without a PASI 50 response. This was similar to the committee's preference in previous NICE appraisals. The committee considered whether the placebo response could be because of the caregiver effect, for example more efficient use of topical creams under the supervision of clinical trial staff. The company responded that topical creams were restricted treatments in the first 24 weeks of the trial. The committee noted that the baseline utility was based on the utility value presented from the clinical trial but that this may still underestimate the utility in the BSC health state. It concluded that some placebo response would also be seen in clinical practice. So, the EAG's scenario which applied PASI response-specific utility from the NMA to those in the BSC specific health state should be used for decision making.

Age-adjusted utility values

3.11 In the company base case, utility values were not adjusted to take account of the natural reduction in utility that occurs with age. The EAG considered that, given the guidance and the lifetime horizon of the model, health state utility should be adjusted for age. The committee considered that to better reflect clinical practice, age-adjusted utility values should be

used and concluded that the EAG scenario which applies these should be used in the base case.

Pooled utility values

3.12 The baseline utility values from the pooled POETYK-PSO trials were unexpectedly higher than those from previous trials in plaque psoriasis. This created a ceiling effect which meant that improvements in utility between the PASI thresholds (for example from PASI 50 to PASI 75) would be smaller than in previous NICE appraisals. The EAG considered that the differences in baseline utility between this trial and trials from previous similar appraisals could indicate differences in baseline characteristics between the trial populations. It was concerned that any such differences could reduce the generalisability of the POETYK-PSO trials to NHS clinical practice. Neither the company nor the EAG could identify differences in baseline characteristics that could explain the higher utility in the POETYK trials. The company proposed to pool utility values from the POETYK-PSO trials with the utility values from 2 other clinical trials, the only 2 sources of psoriasis data publicly available with similar trial characteristics to the POETYK trials. The pooled values were weighted by sample size and used to inform the base case. The EAG considered that this approach was more consistent with previous appraisals. The committee considered that, while it would have been better to understand exactly why baseline utility was higher in the POETYK-PSO trials, the pooling approach gave utility values consistent with previous appraisals and was suitable for decision making.

Drug acquisition cost modelling

3.13 The company modelled drug acquisition costs in the model by applying average drug acquisition costs for each treatment every 2 weeks. The EAG considered that, because the dosing schedule of the drugs do not always align with the induction periods, applying costs every 2 weeks for every drug could lead to an over or underestimation of drug costs. It noted that for treatments when the first maintenance dose was due several

cycles into the modelled maintenance phase, the company's model would overestimate acquisition costs. When the first maintenance dose was due early in the modelled maintenance period, it could underestimate them. The company acknowledged that the modelling of acquisition costs in the base case did not fully reflect how costs would be accrued in practice. The EAG proposed 2 scenarios to explore the impact of the modelling of drug acquisition costs. The committee preferred the scenario in which the full pack size cost was applied to people remaining on treatment when each dose was due for all active treatments in the model. It preferred this scenario because it more accurately reflected what would occur in clinical practice and concluded that this scenario should be used for decision making.

Cost-effectiveness estimates

Company and EAG cost-effectiveness estimates

3.14 The committee considered whether deucravacitinib would be a cost-effective use of NHS resources for people with moderate to severe psoriasis after conventional systemic non-biological treatments. It took into account the patient access scheme for deucravacitinib and commercial arrangements (such as simple discounts or biosimilar prices) for the comparator treatments. Cost effectiveness was assessed by calculating incremental cost-effectiveness ratios (ICERs) for deucravacitinib modelled as the first treatment in a fourth-line treatment sequence compared with 14 comparators also modelled as the first treatment in the sequence.

Committee's preferred assumptions

3.15 The committee recalled that the most relevant comparisons when deucravacitinib was used first in the fourth-line treatment sequence were adalimumab, apremilast or dimethyl fumarate. It also recalled that infliximab was recommended for very severe psoriasis (see section 3.5) so was unlikely to be prescribed for people with moderate to severe psoriasis. So it was excluded from the cost-effectiveness comparison. The

committee understood that adalimumab is generally the first treatment choice when biological treatments are suitable, although others may be used. When compared with adalimumab, bimekizumab or tildrakizumab, deucravacitinib was dominated, which means that it was found to be less effective and more expensive than these treatments. The most plausible ICERs when compared with apremilast and dimethyl fumarate as oral alternatives were below the £20,000 to £30,000 per QALY gained range that NICE normally considers an effective use of NHS resources. The committee also considered the other comparisons provided by the company and EAG, and was aware that deucravacitinib was less effective but also less expensive than most other biological treatments. The ICERs in these cases were above the £20,000 to £30,000 per QALY lost range, which NICE normally considers an effective use of NHS resources. So deucravacitinib was considered cost effective compared with most biological treatments. The committee recalled that it had not seen any evidence about the cost effectiveness of deucravacitinib when used later in the fourth-line treatment sequence, when such comparators could be relevant, but concluded that this was unlikely to affect the cost effectiveness estimates.

Other factors

Equality issues

3.16 During this appraisal 2 equalities considerations were identified:

- The PASI which is used to assess response to treatments for plaque psoriasis was noted to have the potential to underestimate disease severity in people with black or brown skin.
- The DLQI was noted to have limited validity in some people, for example those with a learning disability, older people or those who are not sexually active. It may also miss anxiety and depression.

The committee concluded that if deucravacitinib was recommended, healthcare professionals should take into account how skin colour

could affect the PASI score and make any clinical adjustments needed. It also concluded that, when using the DLQI, healthcare professionals should take into account any physical sensory or learning disabilities, or communication difficulties, that could affect the responses to the questionnaire and make any adjustments needed.

Severity

3.17 NICE's advice about conditions with a high degree of severity did not apply.

Conclusion

Recommendation

3.18 The committee noted there were a large number of treatment options available to people with moderate to severe plaque psoriasis after systemic therapies including apremilast, dimethyl fumarate and systemic biological treatments. The clinical efficacy and costs of these options varied widely. The committee recalled that people are likely to move from 1 fourth-line treatment to another throughout their lifetime. The committee considered adalimumab, apremilast and dimethyl fumarate to be the most relevant comparisons for this evaluation but other comparators should also be considered. Cost-effectiveness results compared with adalimumab showed deucravacitinib was dominated, which means that it was found to be less effective and more expensive. This was also true for bimekizumab or tildrakizumab. This means that deucravacitinib would not be a cost effective use of NHS resources if used when adalimumab, bimekizumab or tildrakizumab were considered to be suitable treatment options. But when compared with apremilast, dimethyl fumarate and most other biological treatments, deucravacitinib was considered a cost-effective option and an effective use of NHS resources. So, deucravacitinib is recommended as an option for treating moderate to severe plaque psoriasis which has not responded to other systemic treatments if people with the condition and their clinicians do not consider

adalimumab, bimekizumab or tildrakizumab to be suitable treatment options.

4 Implementation

4.1 Section 7 of the National Institute for Health and Care Excellence (Constitution and Functions) and the Health and Social Care Information Centre (Functions) Regulations 2013 requires integrated care boards, NHS England and, with respect to their public health functions, local authorities to comply with the recommendations in this evaluation within 3 months of its date of publication.

4.2 The Welsh ministers have issued directions to the NHS in Wales on implementing NICE technology appraisal guidance. When a NICE technology appraisal guidance recommends the use of a drug or treatment, or other technology, the NHS in Wales must usually provide funding and resources for it within 2 months of the first publication of the final draft guidance.

4.3 When NICE recommends a treatment 'as an option', the NHS must make sure it is available within the period set out in the paragraphs above. This means that, if a patient has severe plaque psoriasis that has not responded to conventional treatments and the doctor responsible for their care thinks that deucravacitinib is the right treatment, it should be available for use, in line with NICE's recommendations.

5 Evaluation committee members and NICE project team

Evaluation committee members

The 4 technology appraisal committees are standing advisory committees of NICE. This topic was considered by committee B.

Committee members are asked to declare any interests in the technology being evaluated. If it is considered there is a conflict of interest, the member is excluded from participating further in that evaluation.

The minutes of each evaluation committee meeting, which include the names of the members who attended and their declarations of interests, are posted on the NICE website.

Chair

Baljit Singh

Vice chair, technology appraisal committee B

NICE project team

Each evaluation is assigned to a team consisting of 1 or more health technology analysts (who act as technical leads for the evaluation), a technical adviser and a project manager.

Samuel Slayen

Technical lead

Lorna Dunning

Technical adviser

Leena Issa

Project manager

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